

Respirable Silica Exposure Control Plan (ECP)

Control methods for cutting, drilling, grinding, chipping, jackhammering and polishing of stone, concrete and asphalt

Cutting concrete without proper dust controls can generate high levels of silica-containing dust. Breathing in this fine dust can cause a serious lung disease called silicosis, which is characterized by scarring and thickening of the lungs, and can ultimately result in death.

Health hazards from silica exposure

Long-term exposure to airborne crystalline silica (e.g., quartz) can cause a disabling, sometimes fatal lung disease called silicosis.

When the dust is inhaled deep into the lungs, microscopic particles of silica can cause scar tissue to form in the lung tissue, which restricts the lungs' ability to extract oxygen from the air. This damage is permanent, but symptoms of the disease may not appear for many years.

The disease initially causes fatigue and shortness of breath. If exposure continues, it can lead to chest pain, heart problems (difficulty breathing can strain the heart), and respiratory failure.

Purpose and responsibilities

We have a duty to protect our workers from silica exposure during concrete cutting, grinding and drilling. Studies show that work tasks involving the cutting, grinding, and drilling of concrete generate airborne silica levels well in excess of safe levels. Effective controls are available to protect workers from harmful exposure.

A combination of control measures will be required to achieve this objective. We commit to being diligent in our efforts to select the most effective control technologies available, and to ensure that the best practices, as described in this exposure control plan (ECP), are followed at our worksites.

The work procedures we establish for cutting, drilling, grinding, chipping or jackhammering of concrete will protect not only our workers but also any other workers on-site who are not involved in these operations.

The City of Victoria is responsible for the following:

- Ensure that the materials, tools, equipment, personal protective equipment and other resources (i.e. worker training) required to fully implement and maintain this ECP are readily available where and when they are required
- Ensure that supervisors and workers are educated and trained to an acceptable level of competency in the hazards of silica exposure and trained to work safely with silica

- Maintain records of training, fit-test results, crew talks, and inspections (for equipment, PPE, and work methods and practices)
- Conduct an annual review (or more often if conditions change) of the effectiveness of the ECP. This includes a review of available dust control technologies to ensure these are selected and used when practical
- Coordinate the work with the prime contractor and other employers to ensure a safe work environment

Supervisors are responsible for the following:

- Provide adequate instruction to workers on the hazards associated with the cutting, drilling, grinding, chipping or jackhammering of concrete, cutting fibre cement board or cutting, grinding or polishing of stone
- Select and implement the appropriate control measures
- Ensure that workers using respirators have been properly fit-tested and that the results are recorded and maintained
- Ensure that work is conducted in a manner that ensures the risk to workers and others is minimized and adequately controlled. This includes ensuring that workers use appropriate engineering controls and wear the necessary PPE.

Workers are responsible for the following:

- Use the assigned protective equipment in an effective and safe manner within the scope of their training
- Follow established work procedures as directed by the supervisor
- Report any unsafe conditions or acts to the supervisor
- Report any exposure incidents or any signs or symptoms of silica illness

Risk identification and assessment

- Concrete can contain a high percentage of silica
- Cutting, drilling, grinding, chipping or jackhammering without the use of proper dust controls and PPE can expose workers to levels of airborne respirable crystalline silica that are above the exposure limit listed in the Occupational Health and Safety Regulation
- Work locations where workers or other persons are exposed to the hazards of silica will be identified with signs, placards, or barrier tape

Exposure limits

- The occupational exposure limit (OEL) for respirable crystalline silica (including quartz) is 0.025 milligrams per cubic metre (mg/m³).
- Because crystalline silica is linked to lung cancer, workplace exposures must be reduced to levels that are **As Low As Reasonably Achievable** (ALARA) below the OEL.

Silica dust control

- The Regulation requires employers to select silica dust controls based on the following hierarchy:
 - Engineering
 - Administrative controls
 - Personal protective equipment (PPE)
- Use of respirators as a primary control is not acceptable when other methods are available and practical
- Respirators will be used in conjunction with other controls such as wet cutting, grinding, and drilling to reduce worker exposure to silica, unless air monitoring information suggests otherwise
- Wet cutting, grinding, and drilling or the use of local exhaust ventilation (LEV) are the preferred engineering methods and will be used when practicable
- Dry cutting, grinding, and drilling will be avoided unless additional respiratory protection and other controls are used
- Dry cutting or grinding methods might be required for certain applications or work locations. If this is the case, dry work will be isolated from other work areas. Effective LEV will be used in order to control the dust. A HEPA vacuum will be used for cleanup and decontamination
- Air discharged from an LEV system will not be re-circulated into the work area

Acceptable control methods for: cutting concrete

- The work methods in the following table are acceptable, provided that the respirator selection is adhered to.
- The following control options will be used to eliminate or reduce the risk to workers from the hazards of silica dust exposure, unless air monitoring information suggests otherwise:

Work activity	Dust suppression	Other Controls	Respirator type
Cutting or splitting pavers or blocks with a hand powered splitter	None	Barriers (for example, a tape barrier) to restrict access to the work area	N95 single use respirator
Small cuts of 2-3 meters using a saw	HEPA vacuum extraction or continuous water spray	Barriers (for example a tape barrier) to restrict access to the work area	Half face respirator with 100 series (N, P or R) filters
Large cuts or multiple cuts in one area	HEPA vacuum extraction or continuous water spray	Barriers (for example, a tape barrier) to restrict access to the work area	Full face respirator with 100 series (P or R) filters
Using a saw in a small unventilated area	HEPA vacuum extraction or continuous water spray	Full enclosure systems (with negative air) are required to restrict access to and contain the work area	Full face powered air purifying respirator (PAPR) with 100 series (P or R) filters

NOTE: This work should be conducted in isolation from the general shop and other workers, with some form of general exhaust ventilation.

Acceptable control methods for: concrete drilling

- The work methods in the following table are acceptable, provided that the respirator selection, dust suppression and other controls are adhered to.
- The following control options will be used to eliminate or reduce the risk to workers from the hazards of silica dust exposure, unless air monitoring information suggests otherwise:

Work Activity	Dust Suppression	Other Controls	Respirator Type
Drilling a few (12 or fewer) holes in a wall or ceiling	Dust cap, HEPA attachment on drill, or HEPA vacuum extraction	Barriers (for example, a tape barrier) to restrict access to the work area	Half face respirator with 100 series (N, P or R) filters
Drilling a few (12 or fewer) holes in a floor	HEPA attachment on drill or HEPA vacuum extraction	Barriers (for example, a tape barrier) to restrict access to the work area	Half face respirator with 100 series (N, P or R) filters
	Continuous water spray	Barriers (for example, a tape barrier) to restrict access to the work area	N95 respirator
Drilling more than 12 holes in a wall or ceiling	Drill connected to HEPA vacuum extraction	Barriers to restrict access to the work area or a full enclosure system with negative air (depending on the size of the work area and amount of work)	Full face respirator with 100 series (P or R) filters
Drilling more than 12 holes in a floor	Drill connected to HEPA vacuum extraction	Barriers to restrict access to the work area or full enclosure system with negative air (depending on the size of the work area and amount of work)	Full face respirator with 100 series (P or R) filters
	Continuous water spray	Barriers (for example, a tape barrier) to restrict access to the work area	Half face respirator with 100 series (N, P or R) filters
Drilling holes in a small unventilated work area where standard engineering controls are not practicable	None	Full enclosure systems (with negative air) are required to restrict access to and contain the work area	Full face powered air purifying respirator (PAPR) with 100 series (P or R) filters

Acceptable control methods for: **chipping or jack hammering concrete**

- The work methods in the following table are acceptable, provided that the respirator selection, dust suppression and other controls are adhered to.
- The following control options will be used to eliminate or reduce the risk to workers from the hazards of silica dust exposure, unless air monitoring information suggests otherwise.

Work Activity	Dust Suppression	Other Controls	Respirator Type
Chipping small areas of walls or ceilings	LEV (could include a negative air unit or HEPA vacuum positioned near the working surface)	Barriers (for example, a tape barrier) to restrict access to the work area	Half face respirator with 100 series (N, P or R) filters
	Continuous water spray (could include a portable airless sprayer, air mister, or hose sprayer)	Barriers (for example, a tape barrier) to restrict access to the work area	Half face respirator with 100 series (N, P or R) filters
Chipping large areas of walls or ceilings	LEV (could include a negative air unit or HEPA vacuum positioned near the working surface)	Barriers (for example, a tape barrier) to restrict access to the work area	Full face respirator with 100 series (P or R) filters
	Continuous water spray (could include a portable airless sprayer, air mister, or hose sprayer)	Barriers (for example, a tape barrier) to restrict access to the work area	Full face respirator with 100 series (P or R) filters
Using a chipper in a small unventilated area	NONE	Full enclosure systems (with negative air) are required to restrict access to and contain the work area	Full face powered air purifying respirator (PAPR) with 100 series (P or R) filters
Jack hammering a small area	LEV (could include a sleeve on the tool, connected to a HEPA vacuum or negative air unit)	Barriers (for example, a tape barrier) to restrict access to the work area	Half face respirator with 100 series (N, P or R) filters
	Continuous water spray (could include a portable airless sprayer, air mister, or hose sprayer)	Barriers (for example, a tape barrier) to restrict access to the work area	Half face respirator with 100 series (N, P or R) filters
Jack hammering a large area (or using more than one tool in an area)	LEV (could include a sleeve on the tool, connected to a HEPA vacuum or negative air unit)	Barriers (for example, a tape barrier) to restrict access to the work area	Full face respirator with 100 series (P or R) filters

	Continuous water spray (could include a portable airless sprayer, air mister, or hose sprayer)	Barriers (for example, a tape barrier) to restrict access to the work area	Full face respirator with 100 series (P or R) filters
Using a jackhammer in a small unventilated area	NONE	Full enclosure systems (with negative air) are required to restrict access to and contain the work area	Full face powered air purifying respirator (PAPR) with 100 series (P or R) filters

Acceptable control methods for: cutting fibre cement board

- WorkSafeBC has reviewed the various cutting methods available for fibre cement board and have determined that the methods that appear in the following table are acceptable, provided that the respirator selection is adhered to.
- The following control options will be used to eliminate or reduce the risk to workers from the hazards of silica dust exposure.

Cutting Methods/Tools	Work Location	Respirator Type
Fibre cement shears	Outdoors	None required
Fibre cement shears	Indoors	N95 respirator
Score and snap knife	Outdoors or indoors	None required
Dust reducing circular saw connected to HEPA vacuum extraction	Outdoors	Half face or full face respirator with N100 filters
Dust reducing circular saw connected to HEPA vacuum extraction	Indoors	Half face or full face respirator with N100 filters

Acceptable control methods for: cutting, grinding and polishing stone

- The work methods in the following table are acceptable, provided that the respirator selection is adhered to.
- The following control options will be used to eliminate or reduce the risk to workers from the hazards of silica dust exposure, unless air monitoring information suggests otherwise.

Method	Dust Suppression	Work Location	Respirator Type
Circular saw on table	Water	Shop	N95 Respirator
Hand held circular saw	Water	Shop	Half face respirator with N100 filters
Hand held polisher	Water	Shop	Half face respirator with N100 filters
Circular saw (less than one hour per shift)	HEPA vacuum extraction	On site	Half face respirator with N100 filters
Circular saw (more than one hour per shift)	HEPA vacuum extraction	On site	Full face respirator with N100 filters
Circular saw	NONE	Shop	Full face (PAPR) respirator with N100 filters

NOTE: This work should be conducted in isolation from the general shop and other workers, with some form of general exhaust ventilation.

Safe Work Planning

1. Select one or more of the methods described in the table above
2. Establish a barrier around the work zone to restrict access by unprotected workers
3. Inspect all dust control equipment and tools to make sure they are in good working order
4. Use and maintain all tools as specified by the manufacturer
5. When working off-site, provide the contractor with a copy of the silica exposure control plan and safe work procedures
6. Ensure that workers inspect their respirators before start-up
7. Monitor dust release from equipment during use. When tools and equipment are working properly, very little dust should be visible in the air. Stop work if excessive dust is observed

Respiratory protective equipment

- Each worker who has occupational exposure to respirable silica, will be fit-tested and trained on the proper selection, use, care and maintenance of respirators
- All COV employees required to wear a respirator will follow the City of Victoria Respirator Protection Program.

Other personal protective equipment and hygiene

Workers will wear approved safety glasses and hearing protection when cutting, drilling, grinding, chipping or jackhammering concrete. This equipment will not interfere with the fit of the worker's respirator.

Workers must remove dust covered coveralls or protective clothing before eating lunch.

Workers who launder clothing contaminated with silica should be informed of the hazards of silica and the precautions required for handling the clothing.

Disposable coveralls will be used in full enclosure systems.

Housekeeping procedures

- Dry sweeping and the use of compressed air are **prohibited** for removing dust and debris containing silica.
- Work areas and equipment covered by dust will be cleaned at the end of every shift using a HEPA filter vacuum.
- Wet cleanup may also be used to remove dust.
- Waste material will be placed in a dumpster and will be removed at least weekly. The location and method used to store waste will not allow silica-containing dust to re-enter the workplace.
- Any slurry generated by wet control methods should be cleaned up when the work is completed to avoid secondary dust exposure hazard.
- Filter cloth will be used in catch basins to collect dust and prevent silica dust from collecting in underground areas.
- Supervisors are responsible for ensuring that work areas are free from dust at the end of each shift.

Worker training for silica dust exposure

- Training will be performed by the employer or the employer's designate
- Records of attendance, dates of training, and training material will be documented and retained by the supervisor.
- Additional training or reference material on silica dust exposure will be made available to employees upon request.

Training topics

1. Health hazards of silica dust exposure (including signs and symptoms of silica related disease)
2. Operations and materials that can produce silica dust exposures
3. Engineering controls and safe work practices used to protect workers
4. The importance of proper equipment control and maintenance
5. Housekeeping procedures
6. Proper use of respirators and the respirator program
7. Personal hygiene procedures to reduce exposures
8. How smoking increases the risk of developing silicosis and other lung damage
9. The details of the exposure control program for silica dust

Health surveillance

Workers who are regularly exposed to silica dust should receive regular medical examinations from their family physicians. These examinations should include chest x-rays and lung function testing. Workers will report any symptoms of silica exposure health related illness to the employer and WorkSafeBC, for tracking and investigation.

Annual review

This ECP will be reviewed at least annually and updated as necessary by the employer, in consultation with the workplace health and safety committee or the worker health and safety representative.