Work & Health RISK MANAGEMENT
Streamline International Pty Ltd also T/A
Work & Health Risk Management
ACN 054 139 392 ABN 96 054 139 392

Dr Graeme Edwards
FAFOEM RACP MBBS BMedSci CIME MRO

Senior Occupational Physician
Specialist in Occupational and Environmental Medicine

STANDING COMMITTEE ON LAW AND JUSTICE
2019 REVIEW OF THE DUST DISEASES SCHEME
Legislative Council

Questions on Notice
16 September 2019

Responses from
Dr Graeme Edwards
18 October 2019

1. Mr David Shoebridge asked for a copy of the imaging protocols relating to silicosis being developed by Royal Australian and New Zealand College of Radiologist (RANZCR).

   The draft document referred to when giving evidence has since been published on 11 Oct 2019. A copy is attached for the information of the Standing Committee. It can also be obtained from https://www.ranzcr.com/search/silicosis-position-statement

2. Mr David Shoebridge asked for a comment with respect to a Master Builders Association proposal to apply the existing asbestos safety controls to engineered silica containing materials.

   a. I previously advised the proposal was "not without merit".
   b. I have since looked at the provisions of the Model Laws as they were adopted into the NSW legislation, in particular chapter 8 of the *Work Health and Safety Regulation 2017 (NSW)* version 1 July 2019.
   c. The requirement for a fabricator working with engineered stone in the benchtop setting to be licenced is strongly supported.
   d. In addition, I strongly support developing a Code of Practice for the industry sector similar to that developed in Queensland (see attachment).
      i. A "Code of Practice" carries much greater weight as an enforceable standard, and codifies many of the weakness in the current NSW legislation concerning for example: when should a PCBU arrange air monitoring, to what standard should the air monitoring be performed, the nature of the air monitoring report, and when should a worker be referred for statutory health monitoring.
      ii. While a Code does not preclude the risk of non-compliant practices, it can substantially reduce the likelihood of rogue operators entering or remaining in the industry sector.
      iii. Unlike the existing 'guidance material' produced by either WorkSafe NSW or Safe Work Australia, a Code of Practice provides the "inspectorate" with (i) much clearer standards to underpin their training, and (ii) clear published resources against which a PCBU's conduct can be formally assessed.
      iv. The available guidance material has been written with less precise language and is therefore open to much greater "situational interpretation" when it comes to assessing alternative practices to the stated guidance. Consequently, there is greater variation between inspectors which this creates confusion, opportunities for non-conformance, and overall less robust practices.

e. Unlike asbestos containing material (ACM), quartz and the various forms of silica oxides are ubiquitous in nature and are incorporated into a very wide range of engineered, manufactured, artificial, composite silica containing products, not just "engineered stone" used in the kitchen benchtop sector. This means it could be very difficult to define what is mean by artificial or engineered stone in a way that would enable ready translation of the ACM legislated provisions.

Yours sincerely

Dr Graeme Edwards

Office of Industrial Relations
Workplace Health and Safety Queensland

Managing respirable crystalline silica dust exposure in the stone benchtop industry

Code of Practice 2019

Queensland Government

This Queensland code of practice has been approved by the Minister for Education and Minister for Industrial Relations under section 274 of the *Work Health and Safety Act 2011* and will commence on 31 OCTOBER 2019.

PN12527

Contents

1. Foreword

This code of practice on managing respirable crystalline silica dust exposure in the stone benchtop industry is an approved code of practice under section 274 of the *Work Health and Safety Act 2011* (WHS Act).

An approved code of practice is a practical guide to achieving the standards of health, safety and welfare required under the WHS Act and the Work Health and Safety Regulation 2011 (WHS Regulation).

Under section 26A of the WHS Act duty holders must comply with an approved code of practice or follow another method, such as a technical or industry standard, if it provides an equivalent or higher standard of work health and safety than the standard required in this code.

A code of practice applies to anyone who has a duty of care in the circumstances described in the code. In most cases, following an approved code of practice would achieve compliance with the health and safety duties in the WHS Act, in relation to the subject matter of the code. Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks that may arise. The health and safety duties require duty holders to consider all risks associated with work, not only those for which regulations and codes of practice exist.

Codes of practice are admissible in court proceedings under the WHS Act and WHS Regulation. Courts may regard a code of practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice. This may include issuing an improvement or prohibition notice for failure to comply with a code of practice where equivalent or higher standards of work health and safety have not been demonstrated.

1.1 Scope and application

This code provides practical guidance for persons conducting a business or undertaking on how to manage risks associated with respirable crystalline silica dust exposure in the stone benchtop industry. This includes work to fabricate, process, install, maintain or remove engineered and natural stone benchtops.

This code provides information on how to implement measures to eliminate or minimise so far as is reasonably practicable the risk of exposure to respirable crystalline silica. See Appendix 1 for a definition of key terms.

2. Introduction

Stone benchtops can be made from natural stone, such as granite and marble or from engineered stone. Engineered stone is a man-made product made up of crushed stone such as quartz, resins and other additives. Quartz is a form of crystalline silica found in granite, sandstone, quartzite, various other rocks, and sand. The crystalline silica content in stone benchtops can vary widely depending on the type of stone used. Engineered stone benchtops can contain up to 95 per cent crystalline silica whereas certain natural stones can contain less.[1] Granite, for example, may contain from 25 to 45 per cent, while certain varities of marble (e.g. calcite, dolomite, and onyx) may contain little or no silica. The risks are much greater where the stone contains high levels of silica.

[1] Safe Work Australia: *Crystalline silica and silicosis*

The table below outlines the variation in silica content that can exist in different types of stone.

Product	Silica content (up to)
Engineered stone	90 per cent or higher
Sandstone	70 – 100 per cent
Granite	20 – 45 per cent (typically 30%)
Slate	20 – 40 per cent
Marble	2 per cent
Limestone	2 per cent

Cutting, grinding, trimming, sanding or polishing stone benchtops produces very small particles of dust, including respirable crystalline silica, that are invisible to the naked eye. When breathed in, respirable crystalline silica exposure over time can cause fatal lung disease.

Workers fabricating, processing, installing, maintaining or removing stone benchtops without appropriate control measures in place may be exposed to high levels of respirable crystalline silica. Workers can also be exposed to respirable crystalline silica from poor housekeeping methods which disturb dust, including dry sweeping, using compressed air or high pressure water cleaners, general purpose vacuum cleaners not designed for use with hazardous dusts, or by allowing the accumulation of dust within the workplace.

Generally, workers have a higher risk to their health from exposure to respirable crystalline silica during fabrication of stone benchtops. The more cutting, grinding, trimming, sanding or polishing a worker does the higher the risk to their health. Without adequate controls in place these practices generate dust or mist clouds which may contain very high respirable crystalline silica concentrations.

Stone benchtops that are already installed in the home or workplace do not represent a risk to health unless they are disturbed through mechanical processing such as cutting, sanding or polishing. Information about the controls required during on-site installation, maintenance or removal is provided in section 8.

In 2017, Work Health and Safety Queensland (WHSQ) conducted compliance audits at 10 workplaces in South East Queensland in order to assess the risks to health from respirable crystalline silica in the stone benchtop industry. The purpose of the audits were to:

- identify stone benchtop fabrication processes that expose workers to respirable crystalline silica (e.g. workers performing shaping, saw operation, polishing)
- understand the types of controls used in the industry
- assess and determine the effectiveness of risk control measures in place to manage respirable crystalline silica exposure of workers, which included water suppression, local exhaust ventilation and slurry management
- assess workers' personal exposure to respirable crystalline silica with respect to the existing dust control measures.

Key findings of the audits were that:

- a number of unsafe practices such as uncontrolled dry cutting of stone, poor dust control measures, lack of respiratory protective equipment and a lack of appropriate health monitoring of workers
- [as a result of these sub-standard work practices] many workers in the industry were exposed to very high levels of respirable crystalline silica and as such are at significant risk of developing silicosis

- to effectively control exposure to respirable crystalline silica a range of isolation, dust suppression, dust extraction, respiratory protection and housekeeping controls are required
- without proper controls in place in a fabrication workplace, other workers in the vicinity, for example office workers, may also be exposed to levels of respirable crystalline silica that are hazardous to their health.

Health effects of respirable crystalline silica

Respirable crystalline silica is a significant health hazard for workers. It is too small to be seen under normal lighting and the small particle size allows it to stay airborne for long periods of time. **It is easily inhaled deep into the lungs where it can be deposited and lead to a range of respiratory diseases, including silicosis, progressive massive fibrosis, chronic obstructive pulmonary disease and lung cancer**[2]. Respirable crystalline silica also increases the risk of developing chronic renal disease, autoimmune disorders[3] and other adverse health effects including an increased risk of activating latent tuberculosis.

Silicosis is a serious, irreversible lung disease that causes permanent disability and can be fatal. Respirable crystalline silica dust particles are deposited in lung tissue, causing inflammation and scarring and reducing the lungs' ability to take in oxygen. Silicosis may continue to worsen even long after exposure stops.

As the disease progresses, a worker may experience:

- shortness of breath
- severe cough
- weakness.

It is important to note that damage to lungs from silicosis is permanent and symptoms of the disease may not appear for many years. Workers may not present with any symptoms, even at the point of initial diagnosis, which is why prevention and health monitoring are critical. Health monitoring requirements are detailed in section 8.

There are three types of silicosis:[4]

- *Acute silicosis* is very rare and results from exposure to very short-term and very large amounts of silica (e.g. less than one year, may be weeks or months)
- *Accelerated silicosis* results from short term large amounts of inadequately protected exposure to silica (1 to 10 years exposure) – this was once rare, but has become evident in engineered stone benchtop workers
- *Chronic silicosis* results from long term exposure (10+ years of exposure) to low levels of silica.

There is no cure for silicosis, however all respirable crystalline silica related diseases are preventable by using proper controls to prevent or minimise exposure in the workplace.

An effective silicosis prevention strategy should be based on primary, i.e. controlling the release of respirable crystalline silica dust at source using engineering methods, and secondary, i.e. respiratory protective equipment along with air and health monitoring) prevention approaches[5].

[2] In 1997 the International Agency for Research on Cancer (IARC) made the following evaluation: Crystalline silica inhaled in the form of quartz or cristobalite from work-related sources is carcinogenic to humans (Group 1). Safe Work Australia: *Crystalline silica health monitoring*.
[3] Australian Institute of Occupational Hygienists Respirable Crystalline Silica and Occupational Health Issues Position Paper (2018)
[4] Royal Australian College of Physicians: *Frequently Asked Questions – Accelerated silicosis*
[5] https://www.who.int/occupational_health/publications/newsletter/gohnet12e.pdf

3. Consultation

3.1 Consulting with workers and the role of workers

WHS Act section 47(1): The person conducting a business or undertaking must, so far as is reasonably practicable, consult with workers who carry out work for the business or undertaking who are, or are likely to be, directly affected by a matter relating to work health or safety.
WHS Act section 48(2): If the workers are represented by a health and safety representative, the consultation must involve that representative.

Consultation involves sharing of information, including about sources of exposure and associated health risks, giving workers a reasonable opportunity to express views and taking those views into account before making decisions on health and safety matters.

Consultation with workers, and, where applicable their representative, is required at each step of the risk management process and improves decision-making about health and safety matters and assists in reducing work related injuries and disease. A safe workplace is achieved when everyone involved in the work communicates with each other to identify hazards and risks, talks about health and safety concerns and works together to find solutions.

Workers must be consulted on health and safety matters, including but not limited to:

- identifying the tasks and processes that may result in dust and respirable crystalline silica exposure
- developing a respirable crystalline silica dust control plan
- making changes to processes or procedures that generate respirable crystalline silica
- proposing changes that may affect worker health and safety, e.g. positioning of work spaces or non-fabrication areas and ventilation systems
- making changes to controls to protect workers from respirable crystalline silica;
- resolving health and safety issues
- monitoring the health of workers exposed to respirable crystalline silica, including deciding on the medical practitioner to carry out the health monitoring
- monitoring the conditions at the workplace
- providing information and training for workers.

A person conducting a business or undertaking should also have policies and procedures in place to facilitate the prompt reporting of any health and safety issues, and ensure workers understand and are familiar with those.

WHS Act section 28

While at work, a worker must:

- take reasonable care for his or her own health and safety
- take reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons
- comply, so far as the worker is reasonably able, with any reasonable instruction that is given by the person conducting the business or undertaking to allow the person to comply with this Act.

Workers must co-operate with any reasonable policy or procedure of the person conducting the business or undertaking relating to health or safety at the workplace that has been notified to workers.

The WHS Act includes a duty on workers to take reasonable care for their own health and safety, and to take care that doing or failing to do something does not adversely affect the health and safety of other persons.

Workers are required under the WHS Act to comply, as far as they are reasonably able, with any reasonable instruction that is given by the person conducting the business or undertaking to allow the person to comply with this Act.

Workers are also required to co-operate with any reasonable policy or procedure that relates to health or safety at the workplace (e.g. reporting health and safety issues, wearing respiratory protective equipment and the use of certain tools) notified to workers by the person conducting the business or undertaking.

3.2 Consulting, cooperating and coordinating activities with other duty holders

WHS Act section 46(1): If more than one person has a duty in relation to the same matter each person must, so far as is reasonably practicable, consult, cooperate and coordinate activities with all other persons who have a duty in relation to the same matter.

A person conducting a business or undertaking may share responsibility for a health and safety matter with other business operators who are involved in the same activities or who share the same workplace. In these situations, duty holders must, so far as is reasonably practicable, exchange information to find out who is doing what.

They must work together in a cooperative and coordinated way so that all risks are eliminated or minimised as far as reasonably practicable, for example:

- Consultation, cooperation and coordination must occur between other duty holders on a construction site, including principal contractors, builders and sub-contractors (e.g. carpenters, plumbers and electricians, tilers, cabinet makers), involved in, or near any modification to a stone benchtop during installation to ensure the risk to health associated with exposure to respirable crystalline silica is eliminated or minimised so far as is reasonably practicable, and to ensure information, training and instruction has been provided where applicable.
- Consultation and collaboration between labour hire firms, host employers, and their workers is essential to providing a safe work environment and monitoring worker health. Health monitoring for stone masons who are labour hire workers is a shared duty between the persons conducting a business or undertaking (e.g. the labour hire firm) and the stone benchtop fabrication business to ensure health monitoring is provided and includes making decisions on who will arrange health monitoring and how the cost will be shared.

Further guidance on consultation is available in the *Work health and safety consultation, co-operation and co-ordination Code of Practice 2011*.

4. Duties of manufacturers, importers and suppliers of stone benchtops

Manufacturers, importers and suppliers of engineered and natural stone for benchtop fabrication must ensure so far as is reasonably practicable that stone products are without risks to health and safety. It is critical that duties down the supply chain are met due to the hazardous properties of natural and engineered stone when fabricated, processed, installed, maintained or removed.

4.1 Manufacturers

Manufacturers of engineered stone have a duty to ensure, so far as is reasonably practicable, that the stone is manufactured to be without risks to the health and safety of workers when used for the purpose for which it is manufactured.

WHS Act section 23: A person conducting a business or undertaking who is a manufacturer must ensure, so far as is reasonably practicable, that a substance to be used at a workplace is manufactured to be without risks to health and safety of workers who:

- use the substance for a purpose for which it is designed or manufactured;
- handle and store the substance at the workplace
- carry out any foreseeable activity at the workplace relating to the proper use, handling or disposal of the substance
- are in the vicinity of a workplace and who are exposed to the substance or whose health and safety may be affected by a use or activity of the substance.

The manufacturer must carry out any analysis or testing of the engineered stone necessary to meet their duties and give adequate information to all parties the engineered stone is provided to about:

- the purpose for which the substance has been designed and manufactured
- the results of any calculations and analysis, testing in relation to the engineered stone, including any hazardous properties
- any conditions necessary to ensure the engineered stone is without risks to health and safety when correctly used for the purpose for which it was manufactured.

Manufacturers must provide the following information to all parties their stone product is provided to:

- the amount of crystalline silica contained in the product
- the hazardous properties and risks to health of respirable crystalline silica
- appropriate controls that must be implemented when fabricating or processing, including during installation, maintenance or removal of stone benchtops made from the product.

When the stone is provided to a fabrication business information may be provided in:

- technical or safety data sheets
- product labels fixed to each slab
- similar documents.

Manufacturers, on request, must give all parties who are provided with information on the stone any amendments or updates that are made to this information.

Engineered and natural stone is supplied in slabs which are then used to make benchtops. The slabs of stone themselves are not in a form that would be classified as causing lung damage. It is the respirable crystalline silica dust generated when the stone slabs are cut and shaped (e.g. profiled, polished and edged) to the required size that may cause permanent lung damage.

4.2 Importers and suppliers

Importers and suppliers of natural and engineered stone have a duty to ensure, so far as is reasonably practicable, that the stone is without risks to the health and safety of workers when used for the purpose for which it is made.

WHS Act section 24 and 25: A person conducting a business or undertaking who imports or supplies a substance must ensure, so far as is reasonably practicable, that a substance to be used at a workplace is without risks to health and safety of workers who:

- use the substance for a purpose for which it is designed or manufactured;
- handle and store the substance at the workplace; or
- carry out any foreseeable activity at the workplace relating to the proper use, handling or disposal of the substance.
- are in the vicinity of a workplace and who are exposed to the substance or whose health and safety may be affected by a use or activity of the substance.

The importer or supplier must carry out any analysis or testing necessary to meet their duty and must give adequate information to each person the stone is provided to about:

- the purpose for which the stone has been designed and manufactured;
- the results of any calculations and analysis, testing in relation to the stone, including any hazardous properties; and
- any conditions necessary to ensure the stone is without risks to health and safety when used for the purpose for which it was manufactured.

Importers of natural and engineered stone must take all reasonable steps to obtain information from the manufacturer and then pass this information on when supplying the stone.

If this information is not available, importers must carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary to ensure, so far as is reasonably practicable, that the stone is without risks to the health and safety of any person.

The following information must be given to all parties the stone product is provided to:

- the amount of crystalline silica contained in the product;
- the hazardous properties and risks to health of respirable crystalline silica; and
- appropriate controls that must be implemented when fabricating or processing stone benchtops made from the product.

The information may be provided in:

- technical or safety data sheets
- product labels fixed to each slab; or
- similar documents.

In addition to the information listed above, importers and suppliers could also reference any relevant guidance, for example, technical guides or Codes of Practice, as a resource on their website.

Importers and suppliers, on request, must so far as is reasonably practicable, give all parties who are provided with information on the stone any amendments or updates that are made to the relevant information.

5. Planning for stone benchtop fabrication and installation

WHS Regulation section 49: A person conducting a business or undertaking at a workplace must ensure that no person at the workplace is exposed to a substance or mixture in an airborne concentration that exceeds the exposure standard for the substance or mixture.

5.1 What is the workplace exposure standard for respirable crystalline silica dust?

Workplace exposure standards are airborne concentrations of a particular substance, such as respirable crystalline silica, that must not be exceeded.

The exposure standards are listed in the Workplace Exposure Standards for Airborne Contaminants. The exposure standard for respirable crystalline silica is currently 0.1 milligrams per cubic metre[6] (mg/m^3) (8 hour Time Weighted Average (TWA).[7]

~0.1mg of respirable crystalline silica – equivalent to the workplace exposure standard

The workplace exposure standard for respirable crystalline silica is likely to be exceeded if the amount of dust a worker breathes over a full shift contains more respirable crystalline silica than the amount shown here next to a five cent piece.

The workplace exposure standard for respirable crystalline silica does not represent a line between 'safe' and 'unsafe' airborne concentrations. Everyone is different, and this means that some people might experience adverse health effects below the exposure standard. Under the WHS Regulation persons conducting a business or undertaking:

- must **eliminate** risks to health and safety, or if that is not reasonably practicable
- **minimise** them so far as is reasonably practicable.

Exposure to respirable crystalline silica must be controlled to as low as reasonably practicable, not simply to below the workplace exposure standard.

Short term excursions

The eight hour TWA workplace exposure standard allows for short term excursions above the workplace exposure standard during periods of exposure to an airborne contaminant provided they are compensated for by extended periods of exposure below the standard during that working day. For example, this would mean periods of cutting (higher potential exposure) followed by periods of other activities such as installation without onsite modification (low potential exposure). In practice, the actual concentration of an airborne contaminant arising from a particular process may fluctuate significantly with time. Even where the TWA workplace exposure standard is not exceeded over the period of a shift, short term excursions over the eight hour TWA workplace exposure standard should be controlled.

A process is not considered to be under reasonable control if short term exposures exceed three times the TWA workplace exposure standard for more than a total of 30 minutes per eight hour working day, or if a single short-term value exceeds five times the eight-hour TWA workplace exposure standard for any length of time[8].

The use of engineering controls such as water suppression and local exhaust ventilation should mean the TWA workplace exposure standard is not exceeded, even for short periods.

Adjustment of exposure standards for extended work shifts or overtime

In some circumstances the exposure standard needs to be adjusted to account for greater exposure that occurs during extended work shifts and to comply with the WHS Regulations.

An eight-hour TWA workplace exposure standard is based on exposure that occurs in an eight hour working day over a five-day working week followed by 16 hours of no exposure. Where workers have a working day longer than eight hours, a working week longer than 40 hours, or work shift rotations in

[6] The workplace exposure standard for respirable crystalline silica is currently under review by Safe Work Australia and may change as a result.
[7] The eight hour time-weighted average (TWA) is an eight-hour TWA exposure standard for the maximum average airborne concentration of a particular substance when calculatedpermitted over an eight-hour working day in a five-day working week.
[8] Further guidance on interpreting exposure standards is available at www.safeworkaustralia.gov.au.

excess of either eight hours a day or 40 hours a week, the TWA workplace exposure standard may need to be adjusted to compensate for the greater exposure during the longer work shift and the decreased recovery time between shifts.

Several mathematical models can be used for adjusting exposure standards for extended work shifts. These models include the 'Brief and Scala Model[9]', the US 'Occupational Safety and Health Administration Model[10]', the 'Pharmacokinetic Model' of Hickey and Reist[11], and the Quebec Model[12]. All models provide valid methods for adjusting exposure standards.

The main difference between these models is the degree of conservatism. Selection of a model will depend on the information available and it is important that a competent person such as a certified occupational hygienist is engaged to adjust the exposure standards to account for shift variations or longer work weeks.

It should be noted that exposure standards are never adjusted upwards, even for shifts less than eight hours.[13]

Further guidance on interpreting exposure standards is available at www.safeworkaustralia.gov.au.

5.2 Prohibition on uncontrolled dry cutting/processing

Persons conducting a business or undertaking must not allow workers to undertake uncontrolled dry cutting or processing of engineered or natural stone.

Uncontrolled dry cutting or processing means cutting, grinding, trimming, sanding, polishing or drilling stone containing crystalline silica without effective controls to eliminate or minimise the risk of exposure to respirable crystalline silica. Respiratory protective equipment does not control dust; it protects the workers health.

Existing work health and safety laws in Queensland effectively prohibit uncontrolled dry cutting or processing of engineered stone or natural stone with high levels of crystalline silica as it will expose workers to levels of respirable crystalline silica that exceed the current workplace exposure standard.

5.3 Developing a respirable crystalline silica dust control plan

Due to the significant risks to health from respirable crystalline silica and the large amounts of respirable crystalline silica dust (wet or dry) generated during the work processes involved in fabricating, processing, installing, maintaining or removing stone benchtops it is critical to plan the work so that all sources of dust are identified and the appropriate combination of control measures are in place. The person conducting a business or undertaking must eliminate or minimise the risk of exposure to respirable crystalline silica so far as reasonably practicable.

There are many factors that will impact on the amount of respirable crystalline silica dust workers may potentially be exposed to, including:

- the type of stone and the silica content of the product being used (refer to product label, technical data sheet or similar document)
- the size of the dust (wet or dry) particles being generated
- the amount of dust in the breathing zone of a worker

[9] Brief R, Scala R. Occupational Exposure Limits for Novel Work Schedules, American Industrial Hygiene Association Journal. 36:467-469, 1975.
[10] Paustenbach D. Occupational Exposure Limits, Pharmacokinetics and Unusual Work Shifts. Patty's Industrial Hygiene and Toxicology, Vol III, Ed Harris, R. L., New York, John Wiley & Sons, 11-277, 2000.
[11] Hickey J, Reist P. Application of Occupational Exposure Limits to Unusual Work Schedules. American Industrial Hygiene Association Journal. 38:613-621, 1977.
[12] Institut de recherché Robert-Sauvé en santé et en securité du travail, (IRSST), Guide for the adjustment of Permissible Exposure Values (PEVs) for unusual Work Schedules, 3rd Edition, IRSST, Montréal, 2008

- the work activities being undertaken and the controls in place, e.g. wet cutting and local exhaust ventilation
- how long a worker may be exposed to respirable crystalline silica dust (wet or dry) (e.g. a full shift, or rotating out of the work zone)
- how often a worker is breathing in respirable crystalline silica dust (wet or dry) (e.g. every day).

A person conducting the business or undertaking **that fabricates and processes stone benchtops** should develop a written **respirable crystalline silica dust control plan** to identify all potential tasks that may result in exposure to respirable crystalline silica and the control measures to be used to prevent or minimise exposure.

The respirable crystalline silica dust control plan should consider ways to:
- eliminate or minimise the amount of dust (wet or dry) being produced and released into the air
- prevent dust (wet or dry) being breathed in by workers
- clean up any dust (wet or dry), slurry or other waste produced
- decontaminate workers' clothing and footwear.

The respirable crystalline silica dust control plan should cover:
- the percentage silica content of the product/s being used
- all sources of respirable crystalline silica dust (wet or dry) relevant to that workplace;
- details of the dust (wet or dry) controls to be implemented for each activity following the hierarchy of controls to manage the risk of respirable crystalline silica exposure as follows:
    - engineering controls, such as water suppression and local exhaust ventilation (LEVs) should always be used to eliminate or minimise dust exposure
    - engineering controls should be used in combination with other controls, for example, barriers to prevent other workers entering a work area where processing of the stone containing crystalline silica is taking place;
    - clean up and disposal of dust or wet slurry, and decontamination of workers clothing
    - appropriate respiratory protective equipment must always be used and always in combination with engineering and other controls (see section 6 for further information on controlling respirable crystalline silica dust risks and section 6.3.4 for further information on respiratory protective equipment)
- how the dust (wet or dry) control measures will be integrated into daily shift routines (e.g. tool box talks, pre-start checks and daily cleaning of work areas)
- how air monitoring will be used to assess whether the controls are working, see further information in section 6.2
- systems in place to routinely inspect, maintain and monitor controls and equipment to ensure they are clean and functioning effectively
- ongoing monitoring and review strategies, particularly in response to incidents, control failure, or exposure standard exceedances
- communication of risks and controls, exceedances and reporting mechanisms.

The respirable crystalline silica dust control plan should be developed in consultation with workers involved in carrying out the tasks and the relevant health and safety representative of the work group if one exists.

If a plan has been developed it should be made available to a medical practitioner carrying out health monitoring. An example respirable crystalline silica dust control plan is provided at **Appendix 2**.

6. Identifying respirable dust hazards

The first step in managing risks associated with exposure to respirable crystalline silica is to identify respirable dust (wet or dry) hazards.

Potential respirable crystalline silica dust hazards may be identified in a number of different ways, including:

- conducting a walk-through assessment of the workplace
- observing the work and talking to workers and/or health and safety representatives (HSRs) about how work is carried out
- inspecting the plant and equipment that is used as part of the fabrication and other relevant processes
- undertaking air monitoring at the workplace
- inspecting workplace surfaces for build up of settled dust.

Respirable crystalline silica can be generated and released into the atmosphere during the fabrication of stone benchtops in a number of ways, including:

- cutting, grinding, trimming, drilling, sanding or polishing stone using both powered hand tools or machinery without proper controls in place
- poor slurry management, for example letting the slurry dry out before disposing it
- poor housekeeping methods including dry sweeping and the use of compressed air or high-pressure water
- accumulated dust becoming airborne as a result of vehicles and people moving around the workplace
- inadequate cleaning allowing excessive build-up of dust around equipment and workstations
- wind or air-movement in the workplace causing disturbance of settled dust.

6.1 Fabrication workers and others at risk

Workers may be exposed to respirable crystalline silica when cutting, grinding, sanding and polishing during fabrication, installation, removal or maintenance of stone benchtops. Workers performing other tasks in or near areas where these processes are being undertaken may also be exposed to high levels of dust (wet or dry).

During audits of the industry undertaken by WHSQ, workers undertaking similar tasks were grouped together.

The fabrication workers most at risk of exposure included:

- shapers
- saw operators
- finishers
- machine operators (excluding saw operators)
- polishers.

Other workers at risk of exposure to respirable crystalline silica include:

- workers carrying out non-fabrication tasks, including supervision, maintenance, cleaning, driving forklifts and general labouring
- workers carrying out work adjacent to on-site installation (further information regarding on-site installation is in section 8).

These workers may experience exposure as a result of:

- dust generated during uncontrolled fabrication processes
- poor housekeeping (e.g. disturbing settled dust)
- poor cleaning techniques that distribute dust (e.g. high pressure water, compressed air, dry sweeping).

Potential risk to office workers at fabrication workplaces should also be considered. These workers may be exposed if adequate controls are not implemented and subsequent background levels of respirable crystalline silica are high or if their roles mean they frequently access processing areas. For example, office workers frequently walking through or performing tasks in areas near where the processing of stone benchtops is undertaken may be exposed to high levels of respirable crystalline silica.

Certain tools release more respirable crystalline silica dust into the air

When identifying respirable crystalline silica dust hazards it is important to consider that certain processes and tools generate more respirable crystalline silica. Workers who operate powered hand tools to cut, grind or polish stone, such as circular saws or grinders, have some of the highest respirable crystalline silica exposures of all fabricators. These tools are often used to complete tasks including cutting holes for sinks and stove tops or during shaping edging and profiliing stone. These tasks may occur in a workshop environment or on job sites during installation.

6.2 Air monitoring

WHS Regulation section 50
(1) A person conducting a business or undertaking must ensure that air monitoring is carried out to determine the airborne concentration of a substance to which an exposure standard applies if:

- uncertain on reasonable grounds whether or not the airborne concentration exceeds the exposure standard; or
- monitoring is necessary to determine whether there is a risk to health.

(2) A person conducting a business or undertaking at a workplace must ensure that the results of air monitoring carried out under subsection (1) are—
(a) recorded, and kept for 30 years after the date the record is made; and
(b) readily accessible to persons at the workplace who may be exposed to the substance or mixture.

Air monitoring to determine a worker's exposure (as per WHS Regulation 49) involves measuring the level of respirable crystalline silica in the breathing zone of workers using a personal sampler during the course of their usual shift activities (including routine breaks). Air monitoring must be conducted to determine whether there is a risk to a worker's health, or if there is any uncertainty that the exposure standard is being exceeded.

While air monitoring does not prevent disease and is not an alternative to controlling exposure, it is important to:

- check the ongoing effectiveness of any control measures
- check that any new controls are working effectively
- ensure the workplace exposure standard is not being exceeded at the workplace
- inform workers of the pattern of exposure to the risk of respirable crystalline silica
- help choose the right level of respiratory protection
- inform health monitoring requirements.

Personal sampling of workers at stone benchtop fabrication businesses undertaken by WHSQ has established the airborne concentration of respirable crystalline silica created a significant risk to health and safety.

Similarly exposed group of workers	Description	Range of exposures (mg/m^3)
Shapers	Workers cut holes in slabs for taps, sinks or stovetops and conducted jointing and associated edge grinding of stone predominantly using powered hand tools.	0.69 to 1.03
Saw operators	Workers operated bridge saws or similar slab cutting equipment that used a cutting blade on stone.	0.06 to 0.142
Finishers	Workers conducted all fabrication tasks associated with finishing a bench-top after it had been cut by slab cutting equipment. This included both shaping and polishing processes predominantly using hand tools.	0.057 to 0.110

Similarly exposed group of workers	Description	Range of exposures (mg/m^3)
Machine operators (excluding saw operators)	Workers operated CNC routers or other similar equipment that used a cutting tool on stone. This group included water jet operators.	From less than limit of quantitation (LOQ) to 0.045.
Polishers	Workers bevelled edges and polished stone using powered hand tools.	From LOQ to 0.097.
Labourer/ supervisor	Workers that conducted support tasks including operating forklifts and general labouring or supervision.	From LOQ to 0.058.

When air monitoring is required

Due to the high silica content of engineered stone, the significant risks to health from respirable crystalline silica and the large amounts of respirable crystalline silica dust generated during uncontrolled stone benchtop fabrication, a person conducting a business or undertaking that fabricates stone benchtops must undertake air monitoring.

Stone benchtop fabrication businesses are required to undertake baseline air monitoring:

- **within six months** of:
  - the code commencing (for existing businesses); or
  - a new stone benchtop fabrication business starting
- at **six monthly intervals** for the first two years.

After a baseline is established, air monitoring is required:

- **in response to the triggers outlined below;** or
- **at least every 12 months.**

Triggers for air monitoring outside of schedule above. When:

- there are major changes to work practices (e.g. new equipment being commissioned), production, processes (e.g. redesign of the work process), procedures or control measures since the last assessment which may reasonably be expected to result in new or additional exposures
- a health monitoring report indicates an adverse result in circumstances where the baseline or previous monitoring reports for that worker did not indicate any abnormality
- an HSR requests a review of control measures (as provided under the existing WHS regulation), and current air monitoring records are not available
- the results of worker consultation indicate monitoring is required, for example, receipt of a substantiated complaint from a worker or their representative, or when a substantiated matter is raised by an entry permit holder regarding possible contravention of the workplace exposure standard, and current air monitoring records are not available
- there are changes to the workplace exposure standard where previous air monitoring results have indicated levels above the new WES.

Stone benchtop fabrication businesses that only fabricate very low silica content stone benchtops (e.g. marble) may be able to seek an exemption from the requirement for air monitoring from the regulator. This exemption can be sought under section 685 of the WHS Regulation, which outlines specific matters the regulator must consider in making a decision on an exemption application.

The respirable dust sampling plan and air monitoring

The person conducting a business or undertaking should ensure:

- air monitoring under this code is conducted by an independent competent person (certified occupational hygienist, or a recognised equivalent competency under an international certification

scheme, e.g. certified industrial hygienist) not involved in the business or undertaking of fabricating stone benchtops

- a respirable dust sampling plan is developed by the independent competent person that is representative of worker numbers, workers shift work, tasks performed and conditions at the fabrication workshop
- the respirable dust sampling plan is developed in consultation with workers, and where applicable, any HSRs
- an investigation is conducted when a personal air sampling result exceeds the workplace exposure standard, irrespective of whether respiratory protective equipment was worn. The result of the investigation should be documented, include any corrective actions taken to eliminate or prevent the exposure, and provided to workers and if requested, their representatives. An investigation report must also be made available to an inspector on request
- the competent person provides evidence they:
  - undertake sampling in accordance with AS 2985[14]
  - undertake sampling on a day that is representative of usual exposure across a 40 hour week
  - the air monitoring devices used are calibrated in accordance with the manufacturer's instructions
  - have met the minimum number of samples recommended in Occupational Hygiene Monitoring and Compliance Strategies[15] as shown in the table below.

Group/work force size	Sample size required
1	1
5	5
10	9
15 – 17	12
25 – 29	15
50	22
Source: abbreviated from NIOSH Manual of Analytical Methods (2012) From *Occupational hygiene monitoring & compliance strategies*, p69	

Air monitoring report

The air monitoring report should include:

- background to, and the purpose of the air monitoring
- reference to the applicable eight-hour time weighted average (TWA) workplace exposure standard
- information on the calibration of the sampling equipment used
- what sampling was undertaken and what measurements were taken (static, personal, grab or continuous), and how
- details of the persons, or similarly exposed groups sampled
- any similar exposure groups that may potentially be exposed but were not sampled
- a description of the process measured, the work patterns, and the hazards involved
- identification of tasks or processes not measured that are a likely exposure source
- the control measures observed in place, and their performance
- how and where the samples were analysed (i.e. laboratory and technical details)
- identified exposure sources, discussion of results, compliance with standards, the adequacy of controls and an assessment of risk
- the results related to the sampling plan, including whether the estimated exposure for a similar exposure group has exceeded the workplace exposure standard
- specify the technique used to analyse and interpret the data (e.g. Occupational Hygiene Monitoring & Compliance Strategies (AIOH) or EN 689)

[14] AS 2985 Workplace atmospheres—Method for sampling and gravimetric determination of respirable dust

[15] Grantham, D & I Firth (2014). Occupational Hygiene Monitoring and Compliance Strategies. Australian Institute of Occupational Hygienists Inc. https://www.aioh.org.au/resources/publications1/publications

- recommendations for improvement (e.g. action plan for controls, training, health monitoring)
- recommendations for further air monitoring to measure the effectiveness of any proposed changes.

The air monitoring report must be made available to an inspector on request and should be made available to the medical practitioner conducting relevant health monitoring. In addition a person conducting a business or undertaking at a workplace must ensure that the results of air monitoring carried out are recorded, kept for 30 years after the date the record is made; and readily accessible to persons at the workplace who may be exposed to respirable crystalline silica and their representatives.

7 Controlling respirable crystalline silica dust risks

WHS Regulation section 35: A duty holder, in managing risks to health and safety, must—
(a) eliminate risks to health and safety so far as is reasonably practicable; and
(b) if it is not reasonably practicable to eliminate risks to health and safety – minimise those risks so far as is reasonably practicable.

WHS Regulation section 36: If it is not reasonably practicable for a duty holder to eliminate risks to health and safety, the duty holder must minimise risks, so far as is reasonably practicable, by doing one or more of the following—
(a) substituting (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk;
(b) isolating the hazard from any person exposed to it;
(c) implementing engineering controls.
If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by implementing administrative controls.
If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by ensuring the provision and use of suitable personal protective equipment.

Prevention at the source (water suppression, isolation, on-tool extraction or other exhaust ventilation) is the most effective means of controlling respirable crystalline silica dust. These controls should be accompanied by lower order controls such as respiratory protective equipment and appropriate clean-up, maintenance and training to ensure the risk is eliminated or minimised so far as is reasonably practicable.

7.1 The hierarchy of control measures

Some control measures are more effective than others. Control measures can be ranked from the highest level of protection and reliability, to the lowest. This ranking is known as the *hierarchy of control*.

You must always aim to ***eliminate a hazard*** and associated risk. Elimination is the most effective control measure and must always be considered before all other control measures.For example, using products that do not contain crystalline silica (quartz) would eliminate the hazard completely. However, care should be taken to ensure any new materials are safe to use and don't introduce new hazards.

If this is not reasonably practicable, the risk must be minimised by using one or more of the following approaches:

- ***Substitution*** – replace a hazardous process or material with one that is less hazardous (e.g. using products with less crystalline silica such as a lower crystalline silica content natural stone).
- ***Isolation*** – separating the workers from the hazard and work areas (e.g. installing barriers between workers and machines that produce respirable crystalline silica dust (wet or dry), both for workers generating the dust and workers nearby, such as in adjacent offices).
- ***Engineering controls*** – are physical in nature, including mechanical devices or processes that eliminate or minimise the generation of dust (wet or dry), such as local exhaust ventilation,

including on-tool extraction, and/or water suppression should be used to control each dust generating process.

If a risk remains, it must be minimised by:

- implementing ***administrative controls***, so far as is reasonably practicable. For example, plans to routinely clean the work area and vacuum any residual dust off clothing.
- providing workers with, and training them in the use of, ***personal protective equipment*** (PPE), for example, respiratory protective equipment (RPE) such as powered air purifying respirators must be used. (see section 7.2.4).

Administrative control measures and PPE rely on human behaviour and supervision. If used on their own, they tend to be least effective in minimising risks.

Use a combination of methods

A combination of control measures should always be used to manage the risk of respirable crystalline silica when fabricating, processing, installing, maintaining or removing stone benchtops. Using water suppression, a local exhaust ventilation system and respiratory protective equipment together is an example of a combination of control measures.

7.1.1 Water suppression

Water suppression uses water at the point of dust generation to dampen down or suppress dust before it is released into the air. Water suppression is the most common form of dust control in the stone benchtop industry. Powered hand tools such as grinders or polishers, and large machinery including bridge saws, routers or polishing machines fitted with water feeds are available from manufacturers and retailers in Australia.

Equipment or machinery used for water suppression should:

- have an appropriate ingress protection (IP) rating for use with water suppression
- have the water feed attached and an adequate number of water feeds directed at the contact point to prevent dust being released during the process
- have a consistent water flow and adequate water pressure (usually at least 0.5L/min) during operation
- be fitted with guards, plastic flaps or brush guards designed to manage the water spray or mist containing respirable crystalline silica
- be maintained according to manufacturer's instructions.

See section 7.2.1 for managing respirable crystalline silica contaminated mist resulting from water suppression processes.

In the case of retrofitting, or introducing water suppression into an existing process as a new control, consideration needs to be given to the current electrical equipment's IP rating. Only tools and machinery that have been specifically designed for use with water attachments should be used. A thorough check of electrical equipment, including electrical cords, should also be undertaken to ensure safety when undertaking wet cutting or other processing.

The use of a handheld spray bottle, sponge or garden hose to separately apply water to rotating tools is not permitted. These methods are inadequate to suppress dust and dangerous if used with power tools that are not designed for use with water.

7.1.2 Local exhaust ventilation (LEV)

Local exhaust ventilation is used to remove airborne contaminants before they reach the breathing zone of workers. It is the most effective control for large quantities of respirable crystalline silica dust (dry or wet) as it is applied close to the source of generation. Local exhaust ventilation systems include a shroud (a suction casing that surrounds the wheel/stone), an on-tool hose attachment, and a vacuum system. The dust or mist is collected within the shroud, drawn into the hose attachment to the vacuum, where it is filtered and discharged. When correctly designed and used a local exhaust ventilation system

is able to both capture and contain dust or mist generated from a process. See section 7.3 for information on clean up of tools and equipment throughout the day.

Silica dust (dry or wet) is very abrasive to local exhaust ventilation equipment, which must be regularly inspected for damage and properly maintained.

Figure 1: On-tool extraction[16]

Where the slab can be lifted, place a sacrificial backer-board or spoil-board under the stone slab during cutting or trimming. This prevents dust from being released below the slab thereby increasing the effectiveness of on-tool extraction. MDF or particle board would be suitable for this purpose.

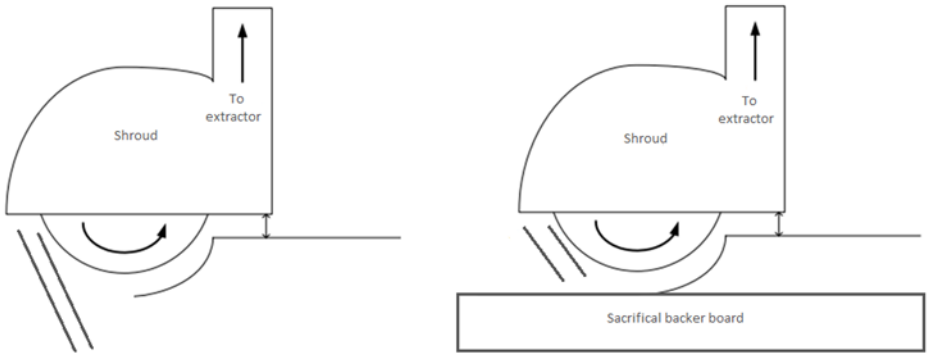

Figure 2: Use of a sacrificial board

Whether a sacrificial backer board can or cannot be used, other controls must be in place. See section 7.1 for further information.

7.1.3 Natural ventilation

Workplaces should have an adequate supply of fresh air.

General ventilation within a room or building can be provided by natural means, such as opening windows and doors. Fans may support the movement of air but should be arranged so that clean air streams are drawn past workers, and contaminated ones away from workers but not into the direction of others (e.g. workers or adjacent businesses).

Caution should also be exercised to ensure fans do not dry wet slurry before it can be cleaned up.

Improving the general ventilation to a room or building may help reduce the concentration of contaminants in the air but cannot be relied as the way to ensure exposure to respirable crystalline silica

[16] Image used with permission from Hilti (Aust)

is managed. Other methods to prevent respirable crystalline silica being released into the atmosphere must be used.

7.2 Prevent workers breathing in dust

Respirable crystalline silica carried in the air as dust or in water mist can be further controlled through guards, enclosures and barriers. In addition to those controls respiratory protective equipment and operational procedures should also be used.

7.2.1 Enclose water suppression processes

As a consequence of applying water to rotating tools, respirable crystalline silica dust contaminated water spray is ejected from the process.

This water spray can expose workers to respirable crystalline silica by:

- being breathed in with the water spray/mist
- drying in the air and breathed in
- depositing on surfaces, including clothing, and later drying, only to become airborne again when disturbed.

Controls should be used to enclose water spray when using water suppression systems. These methods include using guards, plastic flaps or brush guards around the rotating blade or tool or equipment.

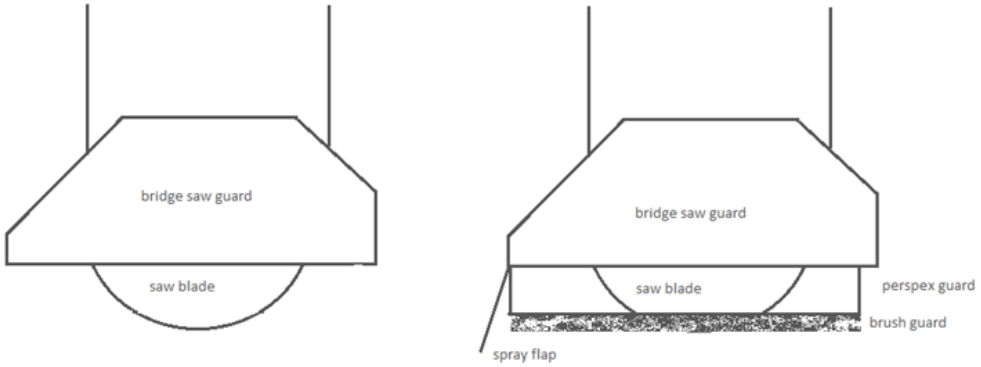

Figure 3: Diagram of additional guards to bridge saw

In addition, other controls that minimise exposure by managing the water spray from water suppression processes include:

- providing distance between the work process and the worker (for example operator positioning when using bridge saws or routers)
- providing distance between workers using powered hand tools and other workers at the workplace
- providing physical barriers between different workers and workstations to prevent the water mist moving into other work areas or towards other workers, including office workers.

Routine maintainence and cleaning also is necessary to ensure guards continue to work effectively.

Figure 4: CNC Router with plastic shrouding. Source – WHSQ Inspectorate

7.2.2 Isolating workers

Isolation is an effective control strategy used alongside engineering controls to reduce to a minimum the number of workers potentially exposed to any residual respirable crystalline silica.

This can be achieved through:

- using physical or temporary barriers such as temporary walls or sheeting, noting barriers do not prevent dust drift and should only be used where natural ventilation is sufficient and dust release is controlled
- enclosing slab cutting, grinding, trimming or polishing equipment
- using fabrication rooms – i.e. water suppression tools or on-tool extraction in a room with an extraction system
- providing workers with a separate room or area away from dust generating processes for food preparation and dining
- [During onsite installation] conducting work outside (follow manufacturer's instructions and ensure contaminated dust does not travel in the direction of other workers or other premises).

Figure 5: An example of isolation, with workers outside of the barrier. Source – WHSQ Inspectorate

7.2.3 Administrative controls to minimise exposure

Administration controls are work practices or procedures that are designed to minimise exposure to a hazard. Due to the levels of dust generated when fabricating, installing, maintaining or removing stone benchtops administrative controls should not be used on their own. **Administrative controls on their own will not provide sufficient control, but rather are intended to enhance higher order control measures.**

Work practices

The way in which work is conducted can influence the generation of respirable crystalline silica dust and exposure to workers.

While the use of higher order controls such as water suppression and local exhaust ventilation together with respiratory protective equipment are critical to minimising the exposure of workers to respirable

crystalline silica dust (wet or dry), the following work practices may also assist in reducing the amount of exposure:

- planning to make the minimum number of cuts for each job
- using machinery and equipment with integrated dust suppression or those designed to generate less dust such as water jet cutters
- implementing systems to ensure routine, or daily checks of critical controls, such as guards and local exhaust ventilation, as well as respiratory protective equipment
- wetting slabs before cutting, grinding, trimming or polishing to remove dust and aid with water suppression
- washing slabs after fabrication to remove any residual dust
- good housekeeping including regular cleaning of work areas
- ensuring workers wash their hands and face thoroughly before eating, drinking or leaving the workplace.

Rotating workers between high exposure and low exposure tasks does not control dust and is not acceptable as a primary control. However, it can be part of a suite of measures taken to minimise the risk to health due to the exposure of workers to respirable crystalline silica.

Safe work procedures

How power tools, equipment and other machinery are used by workers influences the generation of dust. Before plant or equipment is used in your workplace, you must provide your workers and other persons who are to use it with information, training, instruction or supervision that is necessary to protect them from risks, including respirable crystalline silica dust, arising from its use.

Safe work procedures should be developed that include instructions on:

- the correct use of guarding and dust control measures
- how to operate the plant and equipment in a manner that reduces dust exposure
- how to carry out inspections, shut-down, cleaning, repair and maintenance of both the plant and dust control measures
- emergency procedures
- the use of personal protective equipment, such as protective footwear, eye wear, respiratory protective equipment, or an apron.

In addition to safe work procedures, warning signs (Figure 6) should be erected to communicate respirable crystalline silica dust hazards and required personal protection controls.

Figure 6: Warning signs

7.2.4 Use Respiratory Protective Equipment

A respiratory protective equipment (RPE) program must be implemented unless suitable and sufficient air monitoring that estimates the true mean of worker exposure has been carried out and exposure has been assessed as being less than the exposure standard using the 95 percent upper confidence limit.

The RPE program should include:

- providing suitable RPE
- fit testing (if relevant to the RPE used)
- a use, maintenance and repair program
- a facial hair policy for tight fitting respirators

- providing information, training and guidance to workers.

WHS Regulation, sections 44-47: If personal protective equipment (PPE) is to be used at the workplace, the person conducting the business or undertaking must ensure that the equipment is selected to minimise risk to health and safety including by ensuring that the equipment is:
- suitable for the nature of the work and any hazard associated with the work
- a suitable size and fit and reasonably comfortable for the person wearing it
- maintained, repaired or replaced so it continues to minimise the risk
- used or worn by the worker, so far as is reasonably practicable.

A person conducting a business or undertaking who directs the carrying out of work must provide the worker with information, training and instruction in the proper use and wearing of personal protective equipment; and the storage and maintenance of personal protective equipment.

A worker must, so far as reasonably able, wear the PPE in accordance with any information, training or reasonable instruction and must not intentionally misuse or damage the equipment.

RPE should never be used as the primary means for exposure control because higher order controls are more effective. RPE is the least effective form of controlling dust exposure according to the hierarchy of controls, as it does not remove the hazard and relies on correct fit and use by the worker, as well as adequate supervision. However, RPE must be provided and worn correctly for the full duration of the task to manage any residual dust.

Selecting suitable RPE for respirable crystalline silica

A hood or head top type, full face or half face powered air purifying respirator (PAPR) (see Figure 7) with at least a P2 filter must be worn as a minimum by workers carrying out:
- fabricating, processing, cleaning or maintenance work in a fabrication workshop (including labourers and supervisors)
- processing tasks during on-site installation.

PAPR respirators are required because of the high silica content of engineered stone and certain natural stones and the significant health risk from exposure when undertaking these tasks. These types of respirators are also more suitable for Queensland's hot and humid climate and work environments and for wearing for longer periods.

The risks to health from exposure to respirable crystalline silica should also be assessed for any persons working adjacent to or visiting the workshop, e.g. administrative staff or salespeople, and appropriate control measures implemented. Processes should be in place to ensure incidental access by other staff or visitors is minimised or scheduled for periods when fabrication, processing, cleaning or maintenance is not occurring.

PAPRs work by using a fan to draw or push air in through the filter compared to negative pressure respirators which require the user to draw air through the filter which can be taxing on the user and lead to fatigue.

A minimum of a P2 filter combined with PAPR can provide protection up to 50 times the current exposure standard, a level considered necessary when working with engineered stone.

While PAPR represents the minimum required RPE in Queensland for relevant work in the stone benchtop industry, supplied air respirators may also be used. However, as an air compressor's intake may draw air that is contaminated by exhaust emissions from the compressor engine or another nearby source it is recommended a carbon monoxide alarm is used. Further information on managing the risk of carbon monoxide poisoning from air compressors is available at worksafe.qld.gov.au.

Figure 7: Head top full face PAPR[17]

Figure 9: Half face PAPR[19]

Figure 8: half face PAPR with safety glasses[18]

Workers should be consulted on RPE to ensure individual fit and medical factors have been considered.

Quantitative Fit Testing

Due to the high silica content of engineered stone, the associated potential exposure levels and to comply with current Australian Standards, PAPR which rely on a tight seal will require **quantitative fit testing** by a competent person (i.e. an in-house person, manufacturer, supplier or consultant properly trained and proficient in the fit-test method being used). Fit testing measures the effectiveness of the seal between the respirator and the worker's face. If there is not a good seal, contaminated air, potentially containing RCS, could leak into the respirator.

Hood and headtop type PAPRs do not require fit testing as they cover the whole head and do not rely on a tight seal.

[17] Image used with permission from 3M

[18] Image used with permission from CleanSpace Technology Pty Ltd

[19] Image used with permission from CleanSpace Technology Pty Ltd

Fit testing ensures workers wear a respirator that is suitable to their individual facial characteristics. As facial characteristics vary from person to person, it is unlikely that one model or size of RPE will fit everyone and different sizes and models of respirators are available to accommodate these differences.

Facial hair, including beards, moustaches, sideburns and stubble impinging on the seal will stop a respirator from sealing properly.

Workers who are required to wear tightfitting respirators must:

- be clean-shaven; or
- ensure there is no hair between their face and the seal of the respirator face piece as it can interfere with a proper fit. This is important as respirable crystalline silica particles are smaller than facial hair (see Figure 10: Comparison of facial hair with respirable crystalline silica particle size.Figure 10 below); and
- ensure facial hair, clothing or jewellery do not interfere with the respirator seal or inhalation/ exhalation valve operation.

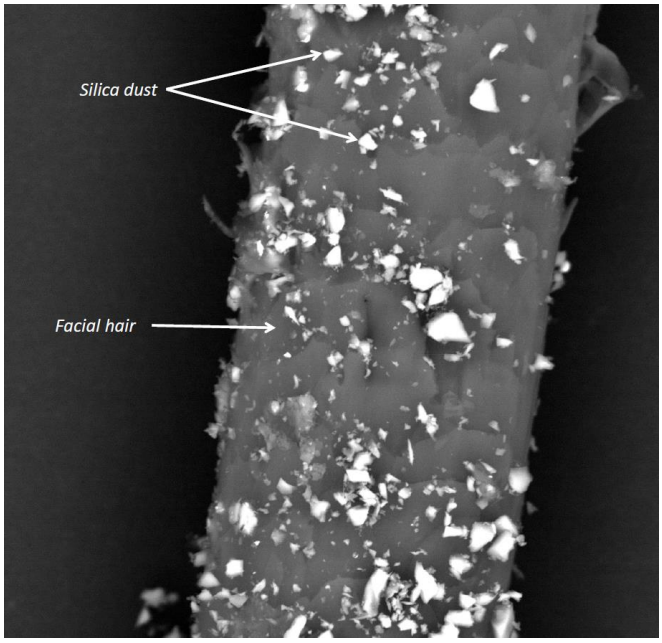

Figure 10: Comparison of facial hair with respirable crystalline silica particle size[20].

Fit testing is required to be carried out:

- by a competent in-house person, manufacturer, supplier or consultant
- before wearing a tight-fitting respirator for the first time
- each time a new make or model of tight-fitting respirator is issued
- whenever there is a change in the worker's facial characteristics or features which may affect the facial seal (for example large weight loss or gain)
- on a regular basis upon risk assessment
- at least annually.

Competency of fit testers

Fit testers must be properly trained and proficient in the fit-test method being used.

There is no approved fit-test training or competency standard in Australia at present however relevant competencies would include[21]:

- knowledge of the respirators used for the fit test

[20] Respiratory Protective Equipment Industry Considerations Air Quality Working Group Information Package - Part 10 (2018) Australian Tunnelling Society and Engineers Australia. Sourced at http://www.ats.org.au/wp-content/uploads/2018/12/AQWG-Part-10-of-12-RPE-Industry-Considerations-v0.07.pdf

[21] International Standard ISO 16975-3:2017 Respiratory protective devices – Selection, use and maintenance – Part 3: Fit-testing procedures indicates fit-test operator competency

- knowledge of the fit-test method
- ability to set up all applicable equipment and monitor its function
- ability to carry out the test and evaluate the results
- ability to identify likely causes of fit-test failure.

Seal checking

Each time a tight-fitting respirator is put on, the worker should carry out a seal check. A seal check is a quick check to ensure the respirator, which has been fit tested, is properly positioned on the face and there is a good seal between the respirator and face. Seal checks do not replace the need for a fit test. Manufacturer's instructions should be followed on how to carry out a seal check.

Maintenance of RPE

Under the WHS Regulation RPE must be maintained, repaired or replaced so as to ensure that it continues to be effective. RPE maintenance should be carried out by a competent person in accordance with the manufacturer's instructions. A competent person is defined in the WHS Regulation as a person who has acquired through training, qualification or experience the knowledge and skills to carry out the task.

A maintenance program should include procedures for:

- daily cleaning and inspection of RPE by the worker for wear, damage and flat batteries
- appropriate storage (e.g. in a dry, clean and sealed container) – each worker should be provided with a dedicated container to store their RPE. Clean, dry RPE should be stored away from dust and out of direct sunlight, and face pieces should be stored so that they are not subject to distortion
- identification and repair or replacement of any worn or defective components of the equipment including filters (including availability of replacement parts)
- regular periodic inspection, maintenance and testing of respiratory protective equipment in accordance with the manufacturer's instructions
- record keeping, including:
    - details of any issues, including the date (for reusable only)
    - user records including training provided
    - fit testing records for each worker including:
        - type of test performed
        - make, model, style and size of respirator tested
        - date of the test
        - result of the test
    - maintenance records including filter replacement and RPE maintenance schedules
    - RPE program records, including procedures for use and audits or evaluations.

Care should be taken to ensure the RPE maintenance program takes into account the environmental conditions the RPE is being used or stored in (e.g. hot work vans) as the rubber seals may persish and require replacing more frequently.

Training workers on the correct use and maintenance of RPE

When issuing RPE, training must be provided to ensure that workers correctly use and maintain RPE.

Training should be provided by a competent person such as a health and safety consultant, a trained person in-house, a representative from a RPE manufacturer or supplier, an occupational hygienist or the holder of a Certificate 4 in Work Health and Safety with expertise or experience in this area. Where the training is being provided in-house, the in-house trainer should themselves have had training from a competent person (as above).

Training in the use of RPE should cover the following topics:

- why RPE is required

- when RPE is required to be worn
- how RPE works
- the limitations of RPE
- how to correctly put on and take off RPE
- how to conduct a seal check
- how to clean and maintain RPE
- when and how to replace filters and batteries (including rechargeable batteries)
- how and where to store RPE when not in use.

Ongoing training and supervision may be required to ensure that RPE is used correctly by workers. Under existing work health and safety laws, workers must take reasonable care for their own health and safety, comply with any reasonable instruction, and cooperate with any reasonable policy or procedure of the person conducting a business or undertaking relating to health or safety. This means a worker must use or wear RPE in accordance with any workplace policy and information, training or reasonable instruction given.

Other personal protective equipment (PPE)

In addition to respirators, other PPE may be required to be used to protect workers depending on the particular work task. The appropriate PPE can be determined by conducting a risk assessment.

Before beginning any dust generating work, conditions likely to affect the health and safety of workers should be assessed and the provision and use of appropriate personal protective equipment should be arranged.

The following items of PPE are examples of what may be used depending on the task and identified risks, in order to prevent the deposit of water containing respirable crystalline silica on clothing that may later dry and become dusty:

- protective footwear (e.g. rubber boots/gumboots – refer to AS/NZS 2210.1 Safety, protective and occupational footwear – Part 1: Guide to selection, care and use)
- protective clothing (e.g. waterproof overalls or an apron).

7.3 Clean up

Stone slabs are often delivered to the fabrication business for processing with a layer of dust or sand, or sent out for installation after processing without being washed down. To minimise the risk, stone slabs should be washed prior to processing and again before sending out for installation.

During a shift it is important to keep respirators on and clean the area, tools and equipment after finishing each job using an H class vacuum cleaner or wet methods such as low pressure hosing, mopping or wet wiping down surfaces.

Figure 11: Hepa filter warning label

Dry sweeping methods, such as using brooms, or using compressed air to clean up a fabrication workshop are not permitted as these methods can recirculate respirable crystalline silica into the air. Household vacuum cleaners must never be used where respirable crystalline silica dust is or may be present, even if they have a HEPA filter.

Figure 12: Warning label

7.3.1 Workers' clothing

Decontamination of workers clothing and PPE

Worker clothes, uniforms and boots must be cleaned frequently to prevent the transfer of respirable crystalline silica dust from work areas to break rooms, other areas of the workplace, or into the home.

H class vacuum cleaners are an easy and effective way to remove excess silica debris from clothes and other PPE.

H class vacuum units should be positioned at the exits of stone benchtop processing areas so workers can decontaminate their clothes before routine breaks or leaving at the end of their shift. Water for hand, face, and hair cleaning should also be provided. A low-pressure hose or tray of water may also be useful for cleaning the bottom of footwear to prevent tracking dust into carpeted areas such as the office or showroom.

It should be noted that the use of effective controls such as water suppression and local exhaust ventilation should result in minimal dust settling.

7.3.2 Housekeeping

General cleaning and housekeeping

Regular cleaning should be undertaken to prevent the build up of dust on floors, walls, other surfaces and equipment. Cleaning should be conducted at least at the end of each day.

To ensure good housekeeping practices:

- implement daily and thorough housekeeping and cleaning procedures for wet slurry and settled dust to prevent dust build up on surfaces in areas where the stone is processed (e.g. walls and building support structures such as girders and cross members)
- use low pressure water, wet sweeping or a H class rated vacuum cleaner to clean floors, walls and other surfaces
- regularly clean vehicle track or high use areas and keep them wet during the day
- prohibit the use of dry sweeping or compressed air to clean surfaces or clothing
- provide low pressure water from hoses for cleaning between tasks
- ensure all waste products are disposed of in a manner that minimises the risk of dust being redistributed over the workplace (e.g. covered, kept wet, bagged).

PPE cleaning and maintenance

The PPE should be cleaned after use to ensure that dust that may contain respirable crystalline silica does not accumulate on the PPE. This may entail hosing off with water or wet-wiping in the case of waterproof gumboots, aprons and gloves.

Under the WHS Regulation PPE must be maintained, repaired or replaced to ensure that it continues to be effective. A maintenance program should include procedures for daily cleaning and inspection of PPE by the worker for wear and damage, and identification and repair or replacement of any worn or defective components of equipment.

Plant inspection and maintenance

WHS Regulation section 213: A person with management or control of plant at a workplace must ensure that maintenance, inspection, and if necessary testing, of plant is carried out by a competent person in accordance with manufacturer's recommendations, or if those aren't available, in accordance with recommendations of a competent person. If it is not reasonably practicable to comply with the manufacturer's recommendations or the recommendations of a competent person, the inspection and testing must occur annually.

Plant must be routinely inspected, maintained and repaired according to the manufacturer's specifications or, in the absence of such specifications, in accordance with a competent person's (i.e. a person who has acquired through training, qualification or experience the knowledge and skills to carry out the task) recommendations.

With regard to the dust control system, the inspection of plant should identify any:

- wear and tear, corrosion or damaged parts
- air leaks in pneumatic tools
- kinks, holes or leaks in water suppression or dust extraction equipment
- filters in need of replacing
- damage to guards and flaps that contain water spray.

Hand-held powered plant should be regularly inspected, repaired or replaced when necessary, and any damaged or worn parts (such as grinding wheels) identified should be replaced.

A system of routine daily checks on plant and equipment designed to control dust should be implemented to ensure they are working effectively. Failures or problems identified should be rectified and workers should be encouraged to report concerns to the person conducting the business or undertaking.

7.3.3 Wet slurry and recycled water

Management of wet slurry

Wet slurry is the resultant waste from dust generating processes that are water supressed. This slurry has the potential to build up from the continuous processing using water suppressed equipment and machinery. While wet the slurry is not hazardous, if it is allowed to dry the dust can become airborne when disturbed and expose workers to respirable crystalline silica.

Wet slurry must be managed by:

- capture or containment through floor grading, grates, curbing and channelling
- keeping floors and surfaces wet
- regularly cleaning, including at the end of each day to prevent wet slurry drying overnight.

Any wet slurry dewatered to still be wet but of a cake consistency should be disposed of in a way that minimises the risk of dust being redistributed over the workplace (e.g. covered, kept wet, bagged).

Recycled water

Water recycled on-site for use in water suppression must be effectively filtered to remove respirable crystalline silica particles. Without an appropriate filtration system there is a risk that continual recycling of water will increase the concentration of respirable crystalline silica in the water over time and subsequently the level of respirable crystalline silica in the mist arising from the water suppression activities.

7.4 Reviewing control measures

WHS Regulation section 37: A duty holder who implements a control measure to eliminate or minimise risk to health and safety must ensure that the control measure is, and is maintained so that it remains, effective, including by ensuring that the control measure is and remains:
(a) fit for purpose; and
(b) suitable for the nature and duration of the work; and
(c) installed, set up and used correctly.

WHS Regulation section 38:
(1) A duty holder must review and, as necessary, revise control measures implemented under this regulation so as to maintain, so far as is reasonably practicable, a work environment that is without risks to health or safety.
(2) A duty holder must review and, as necessary, revise a control measure in the following circumstances—
(a) the control measure does not control the risk it was implemented to control so far as is reasonably practicable (e.g. the results of monitoring show that the control measure does not control the risk or a notifiable incident occurs because of the risk);
(b) before a change at the workplace that is likely to give rise to a new or different risk to health or safety that the measure may not effectively control;
(c) a new relevant hazard or risk is identified;
(d) the results of consultation by the duty holder indicate that a review is necessary;
(e) a health and safety representative requests the review because of a circumstance under (a), (b), (c) or (d) affects or may affect the health and safety of a member of the work group represented by the health and safety representative; and the duty holder has not adequately reviewed the control measure in response to the circumstance.

7.4.1 Daily and routine checks

The control measures put in place to protect health and safety should be routinely reviewed to make sure they are effective.

For example, daily start up checks should be done to ensure:

- machine and water mist guards and local exhaust ventilation are fitted correctly and working effectively
- local exhaust ventilation filters are clean and replaced according to the manufacturer's instructions
- an adequate water supply for water suppression
- RPE is in good condition and seal checked.

The workplace should also be routinely monitored for signs of visible dust on work surfaces or clothing as that may be an indication some controls not working effectively.

Air monitoring, undertaken as required to measure the concentration of respirable crystalline silica dust in the worker's breathing zone during fabrication, is an additional check of the effectiveness of controls.

7.4.2 Review and revision of controls

If control measures are not working effectively they must be revised to ensure effective risk control measures are implemented. The same steps undertaken during initial hazard identification can be used to check control measures.

Consult workers and where applicable their HSRs and consider the following:

- Are there any key triggers that indicate when controls are not working to their designed specification or operation?
- The results of air monitoring, in particular whether there was an exceedance of the workplace exposure standard (see section 5.1)
- Any health monitoring reports recommending a review of control measures (noting that health monitoring results must not be disclosed to any person without the worker's consent).
- When workers may have taken ill
- The outcomes of consultation with workers (or their representatives) and HSRs, or worker complaints
- Have the control measures introduced new hazards?
- Could the proposed new control measures introduce new hazards?
- Have all respirable dust hazards been identified?
- Have new work methods or new equipment made the job safer?
- Are safety procedures being followed?
- Has the training and instruction provided to workers on how to work safely been successful?
- Are workers and where applicable their HSRs actively involved in identifying respirable dust hazards and possible control measures?
- Are workers using the supplied PPE/RPE during relevant work tasks?

If problems are identified, go back through the risk management steps, review information and make further decisions about risk control.

8. Installing stone benchtops

Workers may be exposed to crystalline silica if cutting, grinding, trimming, sanding, drilling or polishing is undertaken during the installation of stone benchtops. Generally, workers have a higher risk of exposure to respirable crystalline silica during fabrication rather than installation of the stone benchtop. However, the more cutting, grinding, trimming, sanding or polishing a worker does the higher the risk to their health.

Respirable crystalline silica will not be released if the benchtop installation is completed without further cutting, grinding, trimming, sanding, drilling or polishing onsite.

Eliminate the need for cuts or alterations

Workers installing stone benchtops that have been completely fabricated in a workshop with no additional cutting or fabrication required on site, should have minimal exposure to respirable crystalline silica compared to workers involved in fabrication.

The need for cutting, grinding, trimming, sanding or polishing during installation should be eliminated by:

- Accurate measuring – whether by templates, diagrams or infrared measuring devices, eliminating measuring errors will eliminate the need for alterations.
- Cutting sink, tap and stove top holes at the workshop – mark and cut the location and size of holes during the fabrication stage or obtain the sink to ensure it fits before installation.
- Taking the slab back to the fabrication workshop when alterations, other than minor modifications, are required.
- Consulting and communicating with principal contractors and clients to prevent alterations on site.

Fabrication and processing on site

There may be circumstances that result in the need to fabricate stone benchtops oversize and trim onsite to fit. Where onsite trimming or alteration cannot be avoided it should be conducted in a controlled exclusion zone with additional controls outlined below. Uncontrolled dry cutting, trimming, grinding or polishing stone is prohibited because it exposes workers and others to large amounts of respirable crystalline silica.

When cutting, grinding, trimming, sanding or polishing stone benchtops during installation the person conducting the business or undertaken must manage the risk of exposure to respirable crystalline silica using the control measures set out in section 7 of this code, including:

- Water suppression, see section 7.1.1
- Local exhaust ventilation (LEV) with sacrificial backer board, see section 7.1.2
- Isolating workers, see section 7.2.2
- Respiratory protective equipment, see section 7.2.4.

In addition to using water suppression and local exhaust ventilation, other measures should be used including:

- conducting work in a well-ventilated area, for example outside (follow manufacturer's instructions and ensure contaminated dust does not travel in the direction of other workers or other premises); and
- excluding workers and others not involved with the cutting or grinding task, for example electricians, by restricting access to the area.

Personal protective equipment

Persons conducting a business or undertaking should also ensure stone benchtop workers are:

- using the recommended respiratory protective equipment (see section 6.3.4). Respiratory protective equipment must always be used and always in combination with engineering and other controls
- provided with personal protective equipment including disposable coveralls or an apron, safety boots or gumboots and hearing protection.

Clean up after installation

Proper clean up of the installation site and associated exclusion zones is important to minimise the risks to health from exposure to respirable crystalline silica to other people, including other trades and occupiers of premises.

Keep respirators on and thoroughly clean the area, tools and equipment after finishing the job using either an H class vacuum cleaner or wet methods such as hosing, mopping or wet wiping down surfaces.

Dry sweeping methods such as brooms or using compressed air should not be used as these methods can recirculate respirable crystalline silica into the air.

All stone waste materials including wet slurry and captured dust should be disposed of in a manner that minimises the risk of dust being redistributed.

Safe work method statements (SWMS)

WHS Regulation section 299: When carrying out high risk construction work, a person conducting a business or undertaking must ensure that a safe work method statement is prepared or has already been prepared by another person.

A safe work method statement (SWMS) for high risk construction work must be prepared before the onsite installation of stone benchtops involving any processing that may release respirable crystalline silica dust is undertaken, for example cutting, grinding, trimming, sanding, drilling or polishing.

High risk construction work is defined as including work 'carried out in an area that may have a contaminated or flammable atmosphere' (WHS Regulation, section 291(l)). As a result, high risk construction work includes work carried out in an area that may be contaminated with respirable crystalline silica dust. Therefore, a SWMS should be prepared before carrying out any onsite installation involving any processing, modification or repair to stone benchtops.

The SWMS must:

- identify the type of high risk construction work being done

- specify the health and safety hazards and risks to health arising from the work
- describe how the risks will be controlled
- describe how the control measures will be implemented, monitored and reviewed.

A SWMS is not required for work undertaken during fabrication at a workshop, but is required for onsite installation where any processing (e.g. cutting, grinding, drilling or polishing) of the slab may occur.

9. Health monitoring

WHS Regulation section 368: A person conducting a business or undertaking must ensure health monitoring is provided to a worker carrying out work for the business or undertaking if the worker is carrying out ongoing work using, handling generating or storing hazardous chemicals and there is a significant risk to the worker's health because of exposure to a hazardous chemical referred to in Schedule 14, table 14.1.

Schedule 14 of the WHS Regulation lists the requirements for health monitoring for crystalline silica including the type of health monitoring.

Health monitoring means monitoring of a person's health to identify changes in their health status because of exposure to certain substances.

Health monitoring for workers exposed to respirable crystalline silica primarily screens for silicosis, chronic obstructive pulmonary disease, autoimmune and other diseases associated with respirable crystalline silica. Health monitoring is necessary to detect the early signs of health effects from exposure to respirable crystalline silica and prevent the development of silicosis. Workers with silicosis do not manifest any symptoms until the disease is well advanced.

Who should be provided health monitoring

Under the WHS Regulation, a person conducting a business or undertaking **must** ensure that health monitoring is provided to the following workers:

- shapers
- saw operators
- finishers
- machine operators (excluding saw operators)
- polishers
- labourer/supervisor involved in the fabrication or installation of stone benchtops.

This is because there is a significant risk to their health during fabrication, processing and installation of stone benchtops (due to the high silica content of engineered stone and certain natural stones and the amount of respirable crystalline silica generated). Health monitoring of workers in higher risk roles should be undertaken.

In addition, other workers who are regularly exposed to respirable crystalline silica at, or exceeding the exposure standard (e.g. supervisors, maintenance workers, office staff and salespeople) should also be provided with health monitoring.

Remember, workers with silicosis may not have any symptoms and silicosis is irreversible.

Worker reluctance to participate in health monitoring

Some workers may be reluctant to participate in health monitoring and this will usually be because they are anxious about the medical results or the impact of the results on their job, or both. Persons conducting a business or undertaking should include information on the purpose of health monitoring

into training and encourage workers to participate, as early diagnosis and treatment can prevent more serious and life-threatening conditions from developing.

Supporting a worker in these circumstances can be achieved by ensuring they know how health monitoring will benefit them, making the process easy for them to follow and, reminding them that their workplace, family and community want them to be as safe and healthy as possible. HSRs at your workplace (where applicable) may also be of assistance in this process and encourage workers to participate in screening for silicosis.

If the conversation with a worker on health monitoring is stalled it may assist the person conducting a business or undertaking to contact WHSQ inspectors for assistance or further information. The person conducting a business or undertaking may also consider contacting the relevant union for the workers. Worker representation groups will have special skills for communicating with workers about the importance of their health and safety in a supportive and empowering manner.

Providing a health monitoring program

A person conducting a business or undertaking must:

- give information to workers and prospective workers about health monitoring requirements
- ensure health monitoring is carried out by or under the supervision of a registered medical practitioner with experience in health monitoring
- consult workers in relation to the selection of the registered medical practitioner
- pay all expenses relating to health monitoring
- provide certain information about a worker to the registered medical practitioner
- take all reasonable steps to obtain a report from the registered medical practitioner as soon as practicable after the monitoring has been carried out
- provide a copy of the report to the worker, and to all other persons conducting a business or undertaking who have a duty to provide health monitoring for the worker, e.g. where labour hire is used
- provide the Queensland work health and safety regulator (the regulator) with a copy of the report if the report contains adverse test results or recommendations that remedial measures should be taken
- keep reports as confidential records for at least 30 years after the record is made
- not disclose the report to anyone without the worker's written consent unless required under the WHS Regulation.

Minimum requirements for health monitoring

Under Schedule 14 Table 14.1 of the WHS Regulation the minimum requirements for health monitoring for crystalline silica are:

- demographic, medical and occupational history
- records of personal exposure
- standardised respiratory questionnaire;
- standardised respiratory function test, for example, FEV_1, FVC and FEV_1/FVC
- chest X-ray full size PA view.

All full size PA chest x-rays are to be taken and read consistent with ILO guidelines[22] (i.e. classified by a B reader or a radiologist who has undertaken Royal Australian and New Zealand College of Radiologists approved training equivalent to the B Reader accreditation).

A B-reader is a radiologist who has undertaken specialised training to detect dust lung diseases such as silicosis, coal workers' pneumoconiosis, mixed dust pneumoconiosis and progressive massive fibrosis.

[22] International Labour Organization (ILO) International Classification of Radiographs of Pneumoconioses

All lung function tests must be performed according to the Thoracic Society of Australia and New Zealand (TSANZ)[23].

Safe Work Australia's Crystalline silica health monitoring guide provides further information on health monitoring for respirable crystalline silica.

When should health monitoring occur?

Health monitoring should be provided:

- **before** a worker starts work to establish a baseline from which changes can be detected (unless the worker has participated in health monitoring within the previous two years and the results of the tests are available)
- **periodically**:
  - **every 12 months** – standardised respiratory questionnaire and standardised respiratory function test;
  - **every three years** – a chest X-ray*, the standardised respiratory questionnaire, and standardised respiratory function test
  - more frequently on the advice of a registered medical practitioner with experience in health monitoring
- **exiting** employment at the workplace - as per baseline if the routine 12-month tests have not been conducted, and it has been more than two years since the previous chest x-ray.

*Note: as stonemasons may work for multiple workplaces within a few years it is important to ask the worker when they last participated in workplace health monitoring in order to avoid the potential for excessive x-rays (e.g. baseline, periodic, exit).

Suitable medical practitioners

Health monitoring must be done or supervised by a doctor with experience in health monitoring. As an example, any doctor who is a fellow of the Australasian Faculty of Occupational and Environmental Medicine will have the necessary experience. A list of these practitioners can be found on the Royal Australasian College of Physicians website.

These lists are not exhaustive and other doctors may have the necessary experience required to conduct health monitoring for respirable crystalline silica. Workers must be consulted when selecting a doctor and their preference considered if they request a particular doctor.

The following information should be supplied to the doctor:

- the name and address of the business
- the name and date of birth of the worker
- a description of any of the worker's tasks that relate to crystalline silica
- how long the worker has been doing the work.

Providing the medical practitioner with any available air monitoring reports would assist them when carrying out a health monitoring assessment.

The health monitoring report

The person conducting the business or undertaking must obtain a health monitoring report from the doctor who carried out the health monitoring. The health monitoring report should only contain

[23] *Standards for the delivery of Spirometry for coal mine workers*, sourced at https://www.dnrme.qld.gov.au/__data/assets/pdf_file/0003/1274421/tsanz-spirometry-standards.pdf

information relating to the health monitoring *commissioned by the PCBU as required under WHS Regulation 2011*.

The health monitoring report should include:

- name and date of birth of worker
- the doctor's details (name and registration number)
- business details (name and address)
- the dates each aspect of health monitoring was undertaken
- details of test results that indicate whether or not the worker has been exposed to respirable crystalline silica
- the professional view regarding whether:
    - the worker has contracted a disease, injury or illness as a result of work with crystalline silica
    - any remedial measures that can be taken by the business
    - the worker can continue in his/her current work
    - medical counselling is required for the worker

Once the health monitoring report has been received from the doctor the person conducting the business or undertaking should act on the results and recommendations and advice contained in it.

Under sections 375 – 377 of the WHS Regulation a copy of the health monitoring report must be provided as soon as practicable after obtaining the report to:

- the worker, even if they leave employment at the workplace
- all other persons conducting a business or undertaking who have a duty to provide health monitoring for the worker, e.g. where labour hire is used
- the regulator,if the report contains:
    - any advice that test results indicate the worker may have contracted a disease, injury or illness as a result of carrying out the work using, handling, generating or storing hazardous chemicals that triggered the requirement for health monitoring; or
    - any recommendation that the person conducting the business or undertaking take remedial measures, including whether the worker can continue to carry out the work using, handling, generating or storing hazardous chemicals that triggered the requirement for health monitoring.

It is recommended workers provide their general practitioner with a copy of the health monitoring report, and retain a personal copy along with any exposure history, particularly when the worker moves to other employment. This will assist an assessing medical practitioner conducting any further health monitoring to compare any previous results with new test and examination results.

The report must not be disclosed to any person without the worker's written consent unless required under the WHS Regulation (e.g. sections 375–377 outlined above).

If the report indicates that a worker is experiencing adverse health effects or signs of illness as a result of exposure to respirable crystalline silica the control measures at the workplace must be reviewed and if necessary revised.

A person conducting a business or undertaking must ensure that health monitoring reports in relation to a worker carrying out work for the business or undertaking are kept as a confidential record: (a) identified as a record in relation to the worker; and (b) for at least 30 years after the record is made.

Treatment programs for adverse health effects should only be discussed between the worker and the medical practitioner and not included in the health monitoring report.

Workers experiencing adverse health effects or signs of illness as a result of exposure to respirable crystalline silica can access further information on health screening and workers' compensation insurance at worksafe.qld.gov.au.

10. Information, training, instruction and supervision

WHS Act section 19(3)(f): A person conducting a business or undertaking must ensure, so far as is reasonably practicable, the provision of any information, training, instruction or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out as part of the conduct of the business or undertaking.

WHS Regulation section 39(2) and (3): A person conducting a business or undertaking must ensure that information, training and instruction provided to a worker is suitable and adequate having regard to:

- the nature of the work carried out by the worker;
- the nature of the risks associated with the work at the time of the information, training and instruction; and
- the control measures implemented.

The person must ensure, so far as is reasonably practicable, that the information, training and instruction provided under this regulation is provided in a way that is readily understandable by any person to whom it is provided.

A person conducting a business or undertaking must provide all workers involved in the fabrication, installation, maintenance or removal of stone benchtops with information, and training on the risks from respirable crystalline silica dust along with all other risks at the workplace.

The person conducting a business or undertaking must also consult, cooperate and coordinate with other duty holders to ensure other workers that may be exposed to respirable crystalline silica through these activities have received adequate training, information and instruction on the nature of the work and the associated risks and controls.

The aim of this training is to educate workers on the hazards, risks, potential health impacts and effective control mechanisms for respirable crystalline silica.

Training topics should include:

- Health hazards associated with respirable crystalline silica dust exposure (including signs and symptoms of silicosis)
- Operations and materials that can produce respirable crystalline silica dust (wet or dry) exposures
- Engineering controls and safe work practices used to protect workers
- The importance of proper equipment control and maintenance
- Housekeeping procedures
- Proper use of respirators and the respirator program, including the requirement for fit testing
- The details of the exposure control plan for respirable crystalline silica dust (if applicable)
- Personal hygiene procedures to reduce exposure
- Health monitoring requirements, including the purpose, description and benefits of health monitoring and outline information and support available to workers in the event of an adverse report
- How smoking can compound the risk of developing silicosis and other lung disease.

In addition, workers involved in fabrication and processing activities should be provided with more general work health and safety information and training including:

- Effects of noise on their hearing and health
- Queensland's work health and safety laws, including this code of practice and other hazards in the workplace
- Work health and safety policies, and relevant procedures at the workplace
- The risk management process
- Inspection and maintenance programs in place at the workplace

- How to access information such as manufacturer's instructions about hazards
- Emergency procedures, including staff with specific emergency roles and responsibilities.

The person conducting the business or undertaking must also consider other persons at the workplace who may be exposed to respirable crystalline silica (e.g. office staff) and what training or information they should be provided with on the risks and control measures in place to manage the risks of respirable crystalline silica dust.

Information, training and instruction must be provided in such a way that it is easily understood and the person conducting the business or undertaking should ensure any training is undertaken by a competent person. A competent person includes a health and safety consultant, a trained person in-house, a representative from a RPE manufacturer or supplier, an occupational hygienist or the holder of a Certificate 4 in Work Health and Safety with expertise or experience in this area.

Records of training provided to workers should be kept, documenting who was trained, when and on what.

11. Other hazards in the stone benchtop industry

Persons conducting a business or undertaking and workers in the stone benchtop industry should also consider their duties and obligations in relation to managing the risks presented by other hazards in the industry:

See more information on how to:

- manage the risks associated with slips, trips and falls
- manage the health and safety risks associated with noise, refer to the *Managing noise and preventing hearing loss at work Code of practice*
- prevent eye and hand injuries
- manage the risks associated with mechanical lifting of slabs (e.g. via gantries, cranes or fork and jib devices)
- manage the health and safety risks of manual tasks, refer to the *Hazardous Manual Tasks Code of Practice*
- manage the risks of carbon monoxide in breathing air during air compressor use (e.g. petrol powered generators and equipment such as hand-held saws in the vicinity of PAPR) as air drawn into the respirator may be contaminated with carbon monoxide. PAPR with particulate filters are not effective against toxic exhaust and as such may present a serious risk to workers who feel protected.

Appendices

Appendix 1 – Dictionary

Appendix 2 – Example respirable crystalline silica dust control plan

Appendix 1 – Dictionary

Key terms

In the context of stone benchtop fabrication:

Air monitoring – is the process of collecting air samples to measure airborne contaminants to monitor workers' exposure. The Safe Work Australia publication Workplace Exposure Standards for Airborne Contaminants provides best practice guidance on air monitoring, for example:

- Where monitoring of airborne contaminants is done to estimate a person's exposure, the monitoring must be carried out in the breathing zone of the person (section 2.5)
- **Breathing zone** means a hemisphere of 300 mm radius extending in front of a person's face and measured from the midpoint of an imaginary line joining the ears.

Crystalline silica – is the crystalline form of the abundant naturally occurring mineral silica or silicon dioxide (SiO_2). It is present in almost all types of rocks, sand, clays, shales and gravel and in construction materials such as concrete, tiles and bricks.

Engineered stone – is an industrially manufactured product made up of crushed stone such as quartz, resins and other additives. Also called artificial or composite stone.

Fabrication – the process of transforming an unfinished stone slab into a specific end product for installation.

Finishing – work to "finish" a benchtop after it has been cut and includes workers who shape (see shaping) the stone and polish.

Machine operators (excluding saw operators) – workers who operate computer numerical control (CNC) routers or water jets.

Maintenance:

- generally, this will be referring to the maintenance of plant or equipment, including dust suppression controls; but also
- covers mechanical polishing or processing of existing stone benchtops.

Polishing – work to bevel edges and polish stone using powered hand tools.

Powered air purifying respirators (**PAPR**) are respirators that work by using a fan to draw or push air in through a filter. Different types include:

- **half-face** and **full-face** respirators have a tight seal that stops contaminants being inhaled. These respirators must be fit tested by a competent person using quantitative methods, and must be seal checked each time the worker uses it.
- **Hood, helmet** or **head top** respirators cover the breathing zone and use positive air pressure to stop contaminants being inhaled. Fit testing is not required.

Processing – carrying out mechanical operations on the stone slab in order to transform it to the end product for example cutting, polishing, trimming and grinding.

Quartz – the most abundant form of crystalline silica. The term quartz can be used in place of crystalline silica.

Respirable crystalline silica – crystalline silica particles which are small enough to penetrate deep into the lung. These particles are too small to be seen under normal lighting and the small particle size allows it to stay airborne for long periods of time.

Respirable dust – small solid particles that are less than 10 micrometres (µm) in diameter and can breathed deeply into the smallest, non-ciliated, airways of the lungs where oxygen and carbon dioxide are exchanged. Respirable particles are too small to be seen by the naked eye.

Saw operators – workers who operate bridge saws or similar slab cutting equipment which uses a blade to cut stone.

Shaping – cutting holes in stone for taps, sinks or stovetops, joinery of stone pieces and edge grinding predominately using powered hand tools.

Slurry – a semi-liquid mixture, typically of fine particles of dust suspended in water.

Workplace exposure standard – The workplace exposure standard for respirable crystalline silica is currently 0.1 milligrams per cubic metre (mg/m^3) **Time Weighted Average** (TWA)).

Appendix 2 – Example respirable crystalline silica dust control plan

Respirable crystalline silica dust control plan for fabricating or processing stone benchtops containing crystalline silica (quartz)

This template will help your business to document the controls used to manage the risks of exposure to respirable crystalline silica dust (wet or dry) during fabricating or processing of stone benchtops. You will need to add details regarding the safe systems of work and practices specific to your operations.

This respirable crystalline silica dust control plan was prepared on [__/__/__] and will be reviewed on [__/__/__].

Business details

Name	
Address	
Contact information (names and phone numbers)	

Details of relevant stone products being used

Product	**Silica content** (sourced from SDS or technical guide)	**SDS reference details**
Example Product 1 [name]	*Example* 70 – 90 %	

Controlling the risk of exposure to respirable crystalline silica

Place	Task	Control methods	Respiratory protection	Work practices	How controls are integrated into daily activities (daily/routine checks and clean-up (see sections 7.3 - 7.4.1))

Example only
Fabrication Workshop
	Example only
	Use of Bridge Saw
		Example only
		Wet suppression system using built in blade water feed nozzle.
		Water spray/mist guards.
			Example only PAPR
			• Head-top/hood type
			• Full/half face
				Example only
				Ensure:
				• water supply to the saw is turned on and operational before starting the saw
				• water is flowing to the cutting area prior to blade making contact with stone
				• spray guards are in place before commencing work
				• regular clean down of saw table and surrounding areas
					Example only
					Tool box talks, pre-start checks and daily cleaning of work areas. E.g. daily checks:
					• water supply & flow
					• safety and spray guards are in place
					• Equipment (including guards) have no visible damage, no visible build up of residue, no blockages
					• Work area is kept clean & slurry managed to prevent drying out
					• PAPR (tight fitting) seal checked each time the respirator is worn
					• PAPR filter check/replace
					  ○ damaged, soiled or breathing becomes difficult
					  ○ set hours of use, e.g. 30 days
					• PAPR performance check
					  ○ battery charge
					  ○ filter alarm
					  ○ flow rate test

Example only Fabrication Workshop	*Example only* Housekeeping - areas adjacent to a workshop, i.e. office and kitchen	*Example only* Wet methods or H Class vacuum should be used to ensure all areas adjacent to fabrication/processing areas are kept free of dust.	*Example only* Not required	*Example only* • Wet wipe surfaces. • Use a wet mop or H Class HEPA-filtered vacuum on floors. • Use a H Class HEPA-filtered vacuum on surfaces that cannot be wet.	*Example only*
Example only Fabrication workshop - maintenance	*Example only* Plant & equipment maintenance	*Example only* Clean any dust residue using wet methods or H Class vacuum before maintaining plant or equipment	*Example only* Minimum P2 disposable when replacing filters and maintaining exhaust ventilation systems	*Example only* • Wet wipe surfaces. • Use a mop or vacuum on floors. • Vacuum surfaces that cannot be wet.	*Example only*
Example only On-site installation e.g. construction site	*Example only* Handheld Angle Grinder (Dry)/ Manual Router for Edge Profiles	*Example only* Minor modification/cut outs only. Controlled dry processing (e.g. using LEV - shroud/hose attached to a H Class HEPA-filtered vacuum) may only be performed where it is not feasible to use wet methods.	*Example only* Head-top type (including high impact visor, type 1 hard hat) PAPR	*Example only* • SWMS to be prepared and given to the PC/PCBU. • Check that shroud, hose and other dust extraction equipment is intact and properly installed. • Ensure the H-class vacuum is maintained, inspected and tested in accordance with manufacturer's instructions including that the H Class HEPA filter is correctly installed and operational. • Clean up area - vacuum or wet-wipe surfaces that cannot be wet down	*Example only*

Respiratory protective equipment program

PCBUs whose workers wear respirators are required to develop and implement a respiratory protection program.

Powered Air Purifying Respirators (PAPR) Register

Worker/s	**Respirator details** (e.g. make, model, size)	**RPE supplied** <date>	**Fit test (tight fitting respirators) conducted by [initials] & [date]**	**Scheduled retest** <date>	**Training in use conducted by [initials] on [date]**	**Maintenance schedule** (E.g. monthly/Annual as per manufacturer's instructions)	**Relevant documents** E.g. 'Clean shaven' policy for tight fitting respirators; user manuals (use, care and maintenance))
Example only Worker X	*Example only* Safe-T-Air model T ½ half face tight fit PAPR size S	*Example only* _ _/_ _/_ _ _ _					
Example only Worker Y (multi-user)	*Example only* Safe-T Helmet and visor with belt pack PAPR						

Details	Carried out (date & initials)	Actions arising from air monitoring report recommendations
Air monitoring - baseline, periodic & in response to specific triggers (see code section 6.2)		
Example only Baseline scheduled • Carried out by [insert name of independent competent person] within 6 months • Carried out by [insert name of independent competent person] 6 - 12 months • Carried out by [insert name of independent competent person] 12 - 18 months • Carried out by [insert name of independent competent person] 18 - 24 months	*Example only* _ _/_ _/_ _ _ _ _ _/_ _/_ _ _ _ _ _/_ _/_ _ _ _ _ _/_ _/_ _ _ _	*Example only* E.g. review of controls, health monitoring, communication of results
Example only Annual air monitoring • Carried out by [insert name of independent competent person] • Carried out by [insert name of independent competent person]	*Example only* _ _/_ _/_ _ _ _ _ _/_ _/_ _ _ _	
Example only Annual air monitoring • In response to [insert specific trigger] (see code section 6.2) • Carried out by [insert name of independent competent person]	*Example only* _ _/_ _/_ _ _ _	
Review and revision of controls (see code section 7.4.2)		
Example only Engineering controls will be reviewed on [insert date]	*Example only* [insert date]	*Example only* [insert date]
• Scheduled	_ _/_ _/_ _ _ _	_ _/_ _/_ _ _ _
• In response to [insert specific trigger]	_ _/_ _/_ _ _ _	_ _/_ _/_ _ _ _

Other items to consider in preparing the respirable crystalline silica dust control plan:

- training (see code section 10)
- health monitoring – at entry, periodically and at exit (unless previous results are available)
- consultation with workers on health and safety matters
- consultation, cooperation and coordination with other duty holders.