



## Workplace Health & Safety Guideline

### Management of Respirable Crystalline Silica in Quarries

September 2018

## IMPORTANT NOTICE – PLEASE READ

This document has been produced by Cement Concrete & Aggregates Australia (CCAA) in good faith and provides general guidance to assist its members in the appropriate management of respirable crystalline silica (RCS) in Australian quarries. Specifically, this document aims to provide general guidance on the obligations in respect to the protection of workers and contractors from the health risks associated with RCS, which may be generated through quarrying activities.

This document should be used in conjunction with members' own assessment of operational matters, occupational health and safety issues and legal obligations particular to their individual situation. It is not a substitute for expert advice (including expert occupational health and safety assessments), which should be obtained by members prior to the commencement of quarrying activities and on an ongoing basis. Further, CCAA does not represent or warrant that this document covers all applicable safety and operational issues in relation to this subject matter.

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This document was prepared having regard to information and opinion sourced by CCAA in good faith prior to September 2018. Further research and development in the area of best practice handling and management of RCS and the mitigation of associated health risks, applicable Australian laws, regulations and standards that are undertaken and issued following this date may affect the accuracy, currency or relevance of the contents of this document. Members must seek their own advice on this.

Further, CCAA acknowledges that it may be appropriate for members having taken their own independent expert advice on the handling of RCS and management of associated risks to adopt operational measures that are at variance to the general guidance provided in this document. This document should be considered as part, but not in substitution for, an overall assessment by members of the circumstances relevant to their particular quarrying activities.

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## ABOUT CEMENT CONCRETE & AGGREGATES AUSTRALIA

Cement Concrete & Aggregates Australia (CCAA) is the peak industry body for the \$15 billion-a-year heavy construction materials industry in Australia.

Our members are involved in the extraction and processing of quarrying products, and the production and supply of cement, pre-mixed concrete and supplementary materials.

CCAA members account for approximately 90 per cent of heavy construction materials produced in Australia and employ over 30,000 Australians directly and support the employment of a further 80,000 people.

Heavy construction materials play a vital role in delivering the infrastructure required for a modern Australian economy. Without these materials we would not have our roads, bridges, airports, homes or hospitals and almost all aspects of the built environment that we depend on.

People have relied on heavy construction materials for thousands of years because of their strength, durability and dependability, and while the technology and processes have improved, these materials are as important to modern society today as they have ever been.



## 1. INTRODUCTION

### 1.1 Purpose

Ensuring the health and safety of workers and contractors is fundamental to the heavy construction materials industry.

The purpose of this document is to provide guidance to quarry operators regarding the appropriate assessment and control of respirable crystalline silica (RCS) in Australian quarries.

This Guideline aims to ensure the protection of workers and contractors from the health risks associated with RCS and in doing so, provide operators with guidance on:

- Work health and safety obligations relevant to RCS;
- The risk management framework;
- Controlling the risk and examples of known controls;
- Responsibilities when undertaking personal exposure monitoring and health monitoring;
- Employee consultation, education and training; and
- Other resources available to industry.

Quarry operations may also have specific obligations in relation to environmental or community impacts of dusts, which sit outside of the scope of this Guideline. Generally speaking however, if the risks associated with RCS dust on workers are being effectively managed, then it is likely the risk to the community is also being managed.

In developing this Guideline CCAA has followed the risk management process prescribed by Safe Work Australia. This step-by-step process provides a planned and systematic approach to risk management that helps operators respond to change and facilitate continuous improvement in their businesses.

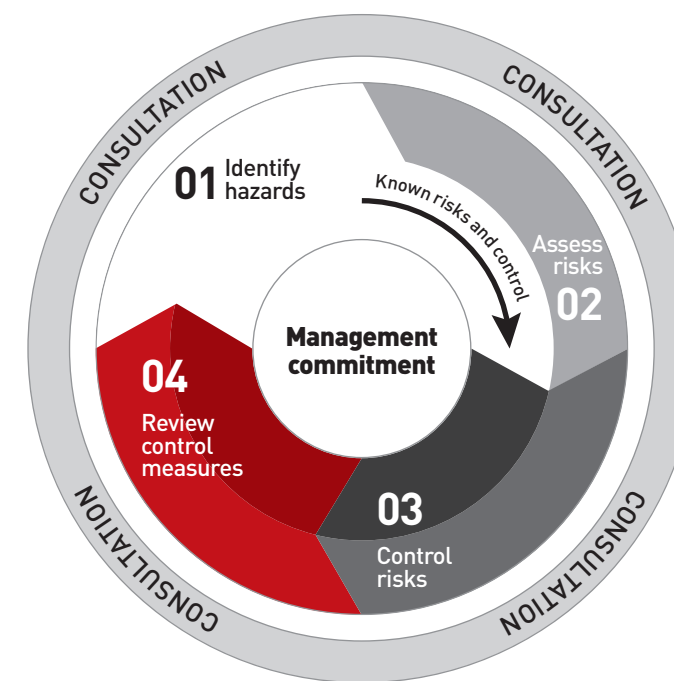


Figure 1: Safe Work Australia - Risk Management Process.<sup>1</sup>

### 1.2 Respirable Crystalline Silica

Silica is one of the most abundant minerals in the earth's crust and forms the major component of most rocks and soils.

Silica occurs in crystalline and non-crystalline (amorphous) forms. Crystalline silica is an aggressive, lung damaging dust when it is able to penetrate deep into the lung in sufficient quantity, whereas the non-crystalline form does not cause such lung damage.<sup>2</sup>

Quartz is the most common form of crystalline silica and is the second most common mineral on the earth's surface.

Respirable crystalline silica or "RCS" is the respirable dust fraction of crystalline silica that can penetrate deep into the lungs. Respirable dusts are defined as being less than 10 microns with a mean diameter of 4.25 microns and are often referred to as "invisible dusts" because they are too small to be seen with the naked eye.

Occupational exposure to RCS can occur in many industries including quarrying, mining, mineral processing (e.g. drying, grinding, bagging and handling), slate working, stone crushing and dressing, foundry work, brick and tile making, some refractory processes, construction work, including work with stone, concrete, brick and some insulation boards, tunnelling, building restoration and in the pottery and ceramic industries.<sup>3</sup>

It is worth noting however, that RCS **is not** present in every quarry and the nature of the risk will depend on the rock source, processing methods and how the site is designed and operated.

### 1.3 Respirable Crystalline Silica and its Health Impacts

Breathing in large amounts of very fine dust of any sort can be harmful; however, particular dusts, like RCS can carry a greater health risk.

RCS dust can penetrate deep into the lungs. The body's natural defence mechanisms may eliminate most of the respirable dust inhaled, however, in the case of prolonged exposure to excessive levels of RCS dust, it becomes difficult to clear from the lungs and an accumulation can, in the long term, lead to serious and irreversible lung disease, predominately silicosis.<sup>4</sup>

Silicosis occurs when respirable crystalline silica is deposited in the air sacs of the lungs. This causes inflammation, which can result in scarring and calcification, and eventually reduced lung capacity.

Silicosis can vary from mild to severe and is generally described as three types:

- Chronic Silicosis** – Is the most common form of silicosis and can develop from prolonged exposure (10 – 30 years) to moderate levels of RCS.
- Accelerated Silicosis** – Occurs within 5 – 10 years of exposure to high levels of RCS.
- Acute Silicosis** – Occurs as a result of extremely high exposures over a relative short period of time (i.e. within five years).

<sup>1</sup> Safe Work Australia, May 2018, p.8

<sup>2</sup> Australian Institute of Occupational Hygienists Inc, 2009, p.8

<sup>3</sup> European Industrial Minerals Association, *Where are we exposed to respirable crystalline silica?*, 2014

<sup>4</sup> European Industrial Minerals Association, *What are the health effects/risks from RCS?*, 2014



Early symptoms of silicosis include shortness of breath, a dry cough and a general feeling of ill health. As the disease progresses the symptoms may become more severe and can lead to permanent disablement and early death.

In addition to silicosis, links have also been made between exposure to RCS and other respiratory diseases such as chronic obstructive pulmonary disease (COPD) and lung cancer.

- **COPD** – COPD is a common, preventable and treatable disease that is characterised by persistent respiratory symptoms and airflow limitation due to airway and/or alveolar abnormalities.<sup>5</sup> Symptoms are often associated with episodes of bronchitis and emphysema. The most commonly encountered risk factor for COPD is smoking with approximately 80 – 85 per cent of COPD cases occurring in people that smoke. There is also evidence of synergistic effects in smokers who are also exposed to dust.<sup>6</sup>
- **Lung Cancer** – The main effect in humans of the prolonged exposure to respirable crystalline silica dust is silicosis. While respirable crystalline silica is classified as carcinogenic to humans (IARC Group 1), there is sufficient evidence to conclude that the relative risk of lung cancer is increased in persons with silicosis. Therefore, preventing the onset of silicosis will also reduce the cancer risk.

The risk and the severity of lung damage varies and depends on the size and shape of the particles, the concentration of particles and the length of time that the person is exposed. Freshly cut or cleaved materials also pose a greater risk due to the formation of reactive free radical species on the newly generated particle surfaces.<sup>7</sup>

**Environmental or community exposures to RCS are much lower than those encountered in the workplace and are not sufficiently high to cause occupational disease.<sup>8</sup> In essence, if the risk to workers is being managed effectively then the risk to the community will also be managed.**

## 1.4 Nature of Quarrying

Quarrying is quite simply the extraction of natural resources from the earth, for the production of a range of useful materials, including limestone, dimension stone and hard rock and sand. In Australia, the most common materials extracted are construction aggregates, such as crushed rock, sand and gravel.

The scale of quarry operations varies from large hard rock quarries applying drill and blast techniques to small mobile sand pits utilising bulldozers and excavators to extract just a few hundred tonnes per annum.

The location of quarries is dictated by the geological resource and as such must be located where the materials exist. It is also important that they be located in close proximity to transport infrastructure, principally roads, to ensure the efficient and affordable supply of materials to market.

Dust can come from a number of sources at a quarry such as extraction, crushing, screening and drill and blast activities. Dust can also be generated from trucks and loaders moving processed materials along haul roads on site.

Exposure to RCS dust may arise in quarries through the mechanical cutting and crushing of sand, stone and gravel containing silica based minerals such as quartz.

**Not all quarries and not all processes will lead to exposure to RCS. The level of risk to workers will differ depending on the concentration of respirable crystalline silica in the rock source, processing methods, how the site is designed and operated and the effectiveness of controls deployed at the site.**

The quarrying industry has a long history of managing dust generation on site to satisfy environmental, community and work health and safety obligations and has over a number of decades sought to reduce dust generation through the application of a range of controls.

### USEFUL RESOURCES:

→ [Factsheet: What is Silica?](#)  
(Lung Foundation Australia, 2017)

→ [What are the Health Effects / Risks from RCS \[EU\]](#)  
(European Industrial Minerals Association, 2014)

## 2. OVERARCHING WORK HEALTH & SAFETY OBLIGATIONS

This section provides an overview of the overarching work health and safety (WHS) obligations that pertain to the management of RCS in Australian workplaces.

The purpose of this section is to provide operators with a general understanding of the WHS obligations relating to RCS. Variation in WHS laws does exist between states and territories and while every effort has been made to reflect these differences throughout this Guideline, it is important to familiarise yourself with the relevant laws in your jurisdiction.

The following sections by no means provide an exhaustive review of ALL WHS laws, regulations and standards that may apply to the management of RCS hazards in quarries. It is the responsibility of the person conducting a business or undertaking (PCBU) to ensure that they are meeting the requirements of all relevant pieces of legislation in their jurisdiction.<sup>9</sup>

The principal WHS laws relevant to quarrying activities in each Australian state and territory are listed in the below table.

STATE OR TERRITORY	RELEVANT LEGISLATIVE FRAMEWORK
New South Wales	<ul style="list-style-type: none"> <li>• Work Health and Safety Act 2011</li> <li>• Work Health and Safety Regulation 2017</li> <li>• Work Health and Safety (Mines and Petroleum Sites) Act 2013</li> <li>• Work Health and Safety (Mines and Petroleum Sites) Regulation 2014</li> </ul>
Victoria	<ul style="list-style-type: none"> <li>• Occupational Health and Safety Act 2004</li> <li>• Occupational Health and Safety Regulations 2017</li> </ul>
Queensland	<ul style="list-style-type: none"> <li>• Work Health and Safety Act 2011</li> <li>• Work Health and Safety Regulation 2011</li> <li>• Mining and Quarrying Safety and Health Act 1999</li> <li>• Mining and Quarrying Safety and Health Regulation 2017</li> <li>• QGL02 - Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries</li> </ul>
Western Australia	<ul style="list-style-type: none"> <li>• Mines Safety and Inspection Act 1994</li> <li>• Mines Safety and Inspection Regulation 1995</li> </ul>
South Australia	<ul style="list-style-type: none"> <li>• Work Health and Safety Act 2012</li> <li>• Work Health and Safety Regulation 2012</li> </ul>
Tasmania	<ul style="list-style-type: none"> <li>• Work Health and Safety Act 2012</li> <li>• Work Health and Safety Regulation 2012</li> <li>• Mines Work Health and Safety (Supplementary Requirements) Act 2012</li> <li>• Mines Work Health and Safety (Supplementary Requirements) Regulation 2012</li> </ul>
Australian Capital Territory	<ul style="list-style-type: none"> <li>• Work Health and Safety Act 2011</li> <li>• Work Health and Safety Regulation 2011</li> </ul>
Northern Territory	<ul style="list-style-type: none"> <li>• Work Health and Safety (National Uniform Legislation) Act 2011</li> <li>• Work Health and Safety (National Uniform Legislation) Regulation 2012</li> </ul>

Table 1: Jurisdictions and the WHS regulatory framework for quarries

<sup>5</sup> Global Initiative for Chronic Obstructive Lung Disease, 2017

<sup>6</sup> European Industrial Minerals Association, What are the health effects/risks from RCS?, 2014

<sup>7</sup> Australian Institute of Occupational Hygienists Inc, 2009, p.9

<sup>8</sup> European Industrial Minerals Association, What is Silicosis?, 2014

<sup>9</sup> Terminology may differ in some jurisdictions, for clarity, the terms “employer” and “PCBU” are considered to have the same meaning for the purposes of this Guideline.

## 2.1 Primary Duties under Work Health & Safety Legislation

The primary duty under WHS Legislation requires the PCBU to ensure, so far as is reasonably practicable, that workers and other people are not exposed to health and safety risks arising from the business or undertaking.

This duty includes **eliminating** exposure to airborne contaminants, so far as is reasonably practicable.

If it is not reasonably practicable to do so, then the risk must be **minimised** so far as is reasonably practicable.

In deciding what is reasonably practicable to protect people from harm, Safe Work Australia guidance<sup>10</sup> states that you should take into account and weigh up all relevant matters including:

- The likelihood of the hazard or risk occurring;
- The degree of harm that might result from the hazard or the risk;
- Knowledge about the hazard or risk;
- Ways of eliminating or minimising the risk; and
- The availability and suitability of ways to eliminate or minimise the risk.

It is only after you have assessed the extent of the risk and the available ways of eliminating or minimising it, that you should consider associated costs, including whether they are grossly disproportionate to the risk.<sup>11</sup>

## 2.2 Exposure Standard for Respirable Crystalline Silica

**It is the duty of the PCBU to ensure that worker exposure to RCS:**

- **Does not exceed the exposure standard of 0.1mg/m<sup>3</sup> time weighted average over an 8 hour working day; and**
- **Is as low as reasonably practicable.**

Safe Work Australia is responsible for prescribing the national exposure standards for substances and mixtures that pose a risk to worker health.<sup>12</sup> These are legal concentration limits that must not be exceeded in the workplace.

Safe Work Australia guidance recognises that exposure standards “do not identify a dividing line between a healthy or unhealthy working environment. Natural biological variation and the range of individual susceptibilities mean some people might experience adverse health effects below the exposure standard. Therefore, exposure standards should not be considered as representing an acceptable level of exposure to workers. They establish a statutory maximum upper limit.”<sup>13</sup>

**The exposure standard for RCS is set at 0.1mg/m<sup>3</sup> on an 8 hour time weighted average** and WHS legislation prescribes that it is the duty of the PCBU to ensure that a worker is not exposed to concentrations above the exposure standard.

An 8 hour time weighted average (TWA) is the average airborne concentration over an 8 hour working day and a 5 day working week. **Where workers have a working day longer than eight hours or work more than 40 hours a week, the exposure standard will need to be adjusted** to compensate for the greater exposure during the longer work shift, and decreased recovery time between shifts.<sup>14</sup>

## 2.3 Personal Exposure Monitoring

Personal exposure monitoring is conducted to ensure compliance with the exposure standard and to assess the effectiveness of controls in the workplace. Personal exposure monitoring is required to be carried out if:

- There is uncertainty whether or not the exposure standard has been or may be exceeded; or
- It is necessary to work out whether there is a risk to health.

Records of personal exposure monitoring must be kept for a minimum of 30 years and must be readily accessible to persons in the workplace who may be at risk of exposure. The States listed in the table below also require that sampling results from personal exposure monitoring be reported to the relevant regulator in some or all circumstances.

STATE	REPORTING REQUIREMENT	AGENCY FOR REPORTING OF EXCEEDANCES
Queensland	Report results of all sampling	Department of Natural Resources Mines and Energy <sup>15</sup>
Western Australia	Report results of all sampling	Department of Mines Industry Regulation and Safety <sup>16</sup>
New South Wales	Report results where an exceedance of the exposure standard has occurred (0.1mg/m <sup>3</sup> )	NSW Resources Regulator <sup>17</sup>

Table 2 : States jurisdictions that require reporting of personal exposure monitoring data

Section 5 of this Guideline provides more detail on standards and procedures for undertaking personal exposure monitoring.

## 2.4 Health Monitoring

Depending on the risk to workers from exposure to RCS, health monitoring may be required. This can include pre-employment and exit medical examinations as well as regular and ongoing health monitoring.

WHS legislation states that the PCBU must ensure that health monitoring is provided to workers if there is a significant risk to the worker’s health because of exposure to RCS.

Health monitoring specific to RCS can involve a respiratory health questionnaire, lung function tests such as spirometry and chest x-rays, to identify changes in a worker’s health status due to exposure.

Refer to Section 7 of this Guideline for more information on health monitoring, including guidance on what constitutes “significant risk”.

## 2.5 Consultation with Workers

WHS legislation requires that you consult, so far as is reasonably practicable, with workers who carry out work for you who are (or are likely to be) directly affected by a work health and safety matter. Additionally, if workers are represented by a health and safety representative, then consultation must involve that representative.

Consultation with workers and their health and safety representatives is required at each step of the risk management process. By drawing on the experience, knowledge and ideas of your workers you are more likely to identify all hazards and choose effective control measures.

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



<sup>10</sup> Safe Work Australia, May 2018, p.7

<sup>11</sup> Ibid.

<sup>12</sup> Safe Work Australia, *Workplace Exposure Standards for Airborne Contaminants*, April 2018, contains the list of workplace exposure standards for airborne contaminants.

<sup>13</sup> Safe Work Australia, *Guidance on the Interpretation of Workplace Exposure Standards for Airborne Contaminants*, April 2013 p.2

<sup>14</sup> Ibid., p.11

<sup>15</sup> Refer to Department of Natural Resources Mines and Energy, *QGL02- Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries*, May 2018

<sup>16</sup> Department of Mines, Industry Regulation and Safety, N.D

<sup>17</sup> Clause 128(r) of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* requires the reporting of exceedances to the crystalline silica workplace exposure limit as a high potential incident.



## 2.6 Documenting your Approach

Documenting your risk assessment process and your intended program of monitoring (both exposure and health monitoring) is important to not only demonstrate compliance with your legislative obligations, but to ensure you have taken a systematic approach to hazard management.

**There may be a requirement within the jurisdiction you operate in that this is included as part of a documented Safety Management System, Hazard Management Plan and/or Health Control Plan. Refer to your local regulator for further information.**

The detail and extent of this reporting will depend on the nature of the risk and the specific requirements of the jurisdiction in which you operate. It is likely, however that you will be required to capture the following matters:

- The outcome of the most recent risk assessment conducted in relation the RCS;
- Data, monitoring and any other tools or methods used to undertake this risk assessment;
- Identification of relevant control measures and how and when they were implemented;
- A process for monitoring and reviewing control measures to ensure they are effective;
- Who you consulted with through the process;
- Worker exposure notification procedures; and
- Your approach to education and training, including records of when training took place.

### USEFUL RESOURCES:

- [Workplace Exposure Standards for Airborne Contaminants](#) (Safe Work Australia, April 2018)
- [Guidance on the Interpretation of Workplace Exposure Standards For Airborne Contaminants](#) (Safe Work Australia, April 2013)
- [Reasonably Practicable – Employer and Business Obligations](#) (SafeWork NSW, N.D)

## 3. RISK ASSESSMENT

Quarry materials by their very nature, being sand, stone and gravel, may result in exposure to RCS through dust generation on site, however the level of risk to workers will differ depending on the concentration of silica in the rock source, processing methods and how the site is designed and operated.

### 3.1 Identify the Hazard

First and foremost, it is important to identify if RCS is present in your operation.

Occupational exposure to RCS can occur in any workplace situation where airborne dust is generated containing a proportion of RCS.<sup>18</sup>

It is worth noting that RCS is not present in every quarry as not all rock types contain crystalline silica. For example a survey sample of CCAA member quarries shows that 30 per cent of hard rock quarries have a silica content of 1 per cent or less in their rock source.

Through petrographic analysis the crystalline silica content of a rock or sand resource is able to be determined. The petrographic analysis should be relevant to the material being extracted, this is particularly important for sites that have several reserves from which they extract. In these cases, a petrographic analysis will need to be completed for each distinct reserve.

Another factor to consider is that the characteristics of a rock source may change throughout the life of a quarry, particularly as the pit is extended or new locations explored. Again, it is important that the petrographic analysis is up to date and representative of the material that is being extracted. Quarries often require a petrographic analysis for sales and quality testing purposes. To minimise cost, quarry operators should consider aligning testing for crystalline silica with these petrographic analyses.

### 3.2 Assess the Risk

Assessing the risk means working out how likely it is that a hazard will harm someone and how serious the harm could be.

A risk assessment can help you determine:

- How severe a risk is;
- Whether any existing control measures are effective;
- What action you should take to control the risk; and
- How urgently the action needs to be taken.

Safe Work Australia's *Model Code of Practice on How to Manage Work Health and Safety Risks* provides practical guidance for persons who have duties under WHS legislation and provides a framework for undertaking risk assessment.<sup>19</sup>

Once you have identified the presence of crystalline silica the next step is to assess the risk as it relates to the respirable fraction of crystalline silica dust. This is an important point of distinction because often sand operations will have a high crystalline silica content (as do beaches), but the risk to health will depend on the presence and extent of the respirable fraction of this dust.

When assessing the specific risk of RCS at your operations, it is important to address the following questions:

- What substances and materials may give rise to RCS in your workplace?
- What are the processes or activities that may generate RCS?
- Which workers may be exposed to RCS, in which location and during what tasks?
- What are the existing control measures in place to manage RCS and/or respirable dusts?
- Is the exposure reduced to an acceptable level and, at a minimum, consistently below the exposure standard of 0.1mg/m<sup>3</sup> on an 8 hour TWA for any activity or task that may create an unacceptable RCS exposure?
- Is there monitoring and verification in place to ensure the ongoing effectiveness of controls and that exposures are kept to an acceptable level?



<sup>18</sup> NEPSI The European Network on Silica, 2006, p.17

<sup>19</sup> Safe Work Australia, May 2018

Table 3 identifies the types of activities that may generate RCS in quarries.

Baseline monitoring of personal exposure is recommended as part of the risk assessment processes, as well as an ongoing tool to monitor and verify that controls are effective. Personal exposure monitoring must be undertaken in accordance with relevant test methods and by a competent person. It is recommended you consult a specialist, such as an occupational hygienist, to design, perform and interpret the results of a personal exposure monitoring program. Further detail on personal exposure monitoring is discussed in Section 5.

The European Network on Silica, otherwise referred to as NEPSI, has developed a Good Practice Guide for managing RCS and its safe use in the workplace. The *Good Practice Guide* provides step by-step guidance for accessing the risk of exposure to RCS to ensure appropriate controls and personal exposure monitoring is in place.

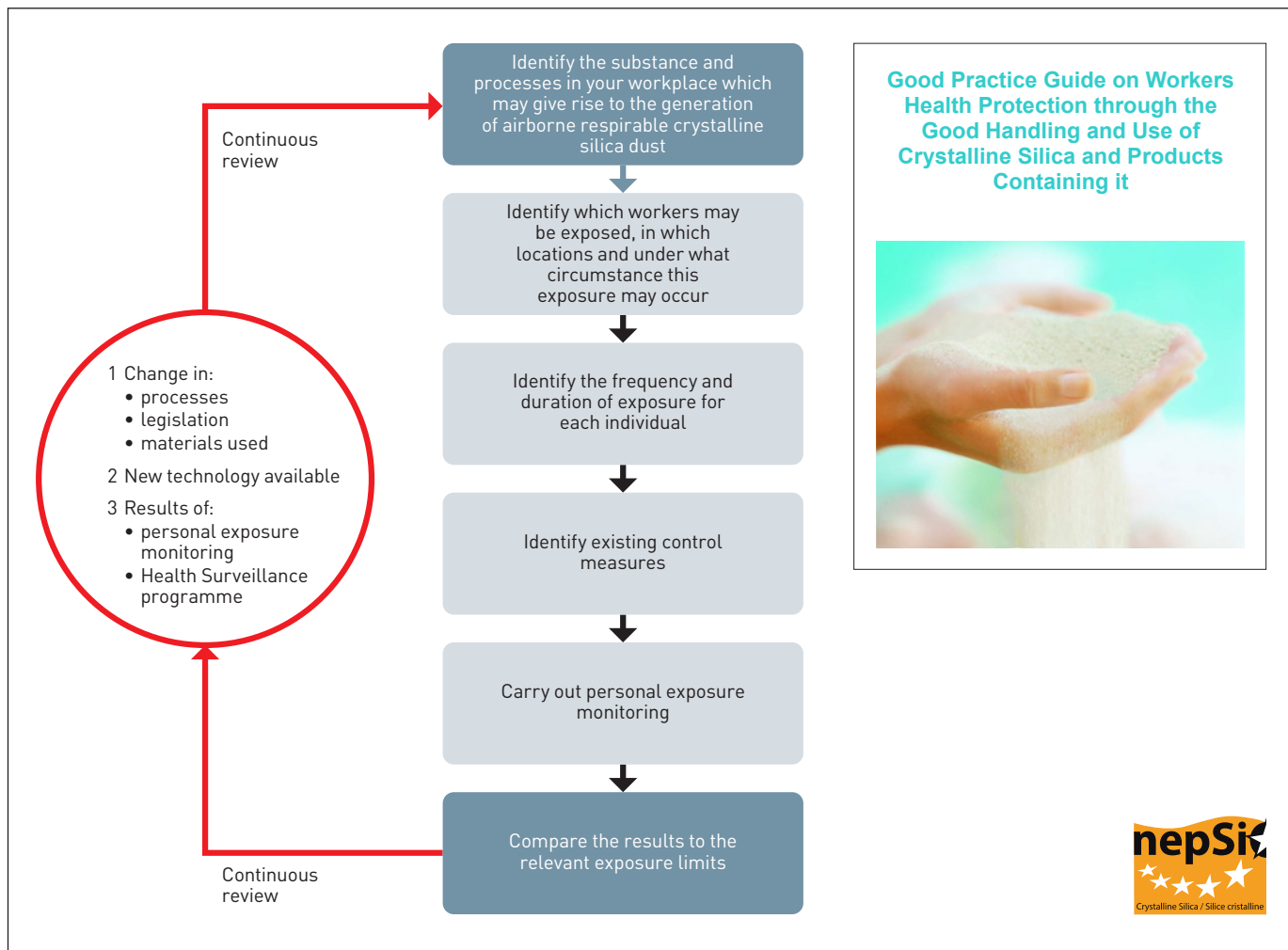


Figure 2: European Network on Silica - Good Practice Guide

**USEFUL RESOURCES:**

- [Good Practice Guide on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products Containing it](#) (NEPSI The European Network on Silica, 2006)
- [Model Code of Practice: How to Manage Work Health and Safety Risks](#) (Safe Work Australia, May 2018)
- [Working with Respirable Crystalline Silica](#) (Mineral Products Association (UK), 2017)

## 4. CONTROL THE RISK

If through the risk assessment process it is found that a worker or workers are exposed to levels above the exposure standard then it is the duty of the PCBU to notify the worker (and the regulator where applicable, refer to table 2) and to introduce controls to firstly eliminate, or secondly minimise, the risk so far as is reasonably practicable.

Reducing exposure to an adequate level always involves a mixture of equipment and ways of working. This means the PCBU should:

- Choose the most effective and reliable control measures, taking into account the *Hierarchy of Control*;
- Make sure controls are implemented properly by instructing, training and supervising workers;
- Use regular maintenance to make sure control measures keep on working; and
- Check and review all elements of control measures regularly for their continued effectiveness.<sup>20</sup>

### 4.1 Hierarchy of Control

Nationally, WHS legislation requires duty holders to work through the *Hierarchy of Control* when managing health and safety risks.

Using this approach, the first priority should be to eliminate the hazard. If elimination is not reasonably practicable, the risk should be minimised by doing one or more of the following controls:

- I. Substituting (wholly or partly) the hazard with something that creates a lesser risk;
- II. Isolating people from being exposed to the hazard;
- III. Implementing engineering controls.

If the hazard cannot be minimised through these methods then an administrative control or use of personal protective equipment (PPE) may be warranted. Administrative controls are work methods or procedures that are designed to minimise exposure to a hazard (e.g. the use of signs to warn people of the hazard).

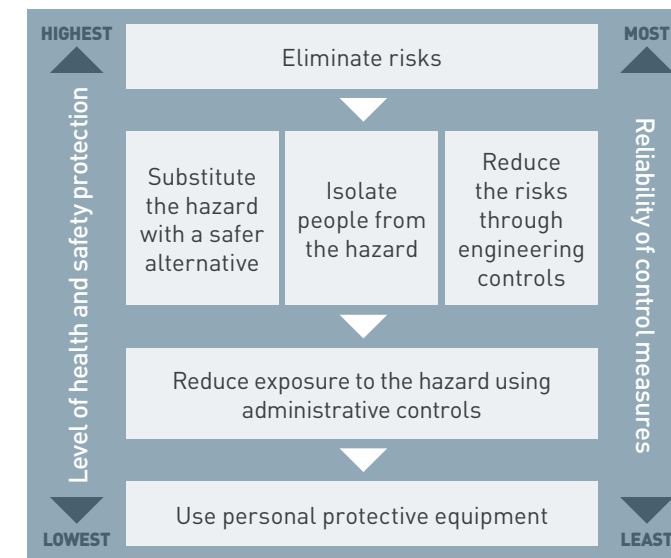


Figure 3: The Hierarchy of Control.<sup>21</sup>

### 4.2 Examples of Control Measures

While it is often impractical to eliminate silica from quarrying processes given its presence in the rock itself, there are a number of controls available to industry to reduce the likelihood and severity of exposure.

Dust mitigation is not new to the quarrying industry and many control methods or concepts are already well known for the management of environmental and health risks associated with dust.

In all cases, the primary goal should be to minimise exposure to RCS so far as reasonably practicable and ensure exposure is no greater than the exposure standard.

Controlling dust at the source is the key to effective control.

It is far more effective to prevent and minimise the generation of RCS dust than it is to manage the risk in the air, or reduce the risk to each worker.

Adequate ventilation, water applications and other dust suppressants, enclosing machinery, good housekeeping and isolation of workers are the best answers to the problem.

When selecting the appropriate control, it is important that the control specifically addresses RCS generating sources. It may be that more than one control is needed to reduce the risk and what is a suitable control for one site may not be suitable for others.

Appropriate controls are the ones that are assessed with the specific characteristics of the site in mind. Effective controls can only be achieved with proper analysis of RCS sources, identification of appropriate control technologies, and consistent application and maintenance of the controls selected.<sup>22</sup>

<sup>20</sup> UK Health and Safety Executive, 2017

<sup>21</sup> Safe Work Australia, May 2018, p.19

<sup>22</sup> National Institute for Occupational Safety and Health, 2012



Table 3 below provides examples of the kinds of controls that can be applied in quarry operations to minimise RCS exposure to workers.

ACTIVITY OR SOURCE	CONTROL EXAMPLES
<b>Heavy Mobile Equipment</b>	Well maintained air conditioning with a fitted dust filtration system designed to withstand a high loading of respirable dust particles. Doors and windows of the cab must be kept closed at all times. Cabins should be well sealed and these seals checked regularly to ensure effectiveness. Vehicle cabins should be cleaned and vacuumed regularly to avoid the accumulation of dust which can be disturbed by operators.
<b>Drilling</b>	Control dust on drills by using either: <ul style="list-style-type: none"> <li>• A wet suppression system; or</li> <li>• A dry cyclone/filter type collector.</li> </ul> Isolate workers from dusts in an air conditioned cab (see above).
<b>Crushing Plant</b>	If possible, locate the crusher outdoors, away from occupied buildings. Restrict access to the work area to authorised personnel only. Reduce dust emissions by: <ul style="list-style-type: none"> <li>• Using dust extraction ventilation;</li> <li>• Enclosing plant;</li> <li>• Using water sprays, foams and foggers; or</li> <li>• Reducing the clearance under the crusher.</li> </ul> Isolation of workers from dust generating plant by: <ul style="list-style-type: none"> <li>• Segregating the operator in a ventilated control room;</li> <li>• Installation of self-closing doors in control rooms and other building sites;</li> <li>• Using CCTV systems to enable operators to check the operation of the crusher without being exposed; or</li> <li>• Locating machinery controls away from sources of dust generation (i.e remote controlled rock breakers).</li> </ul>
<b>Screening</b>	Dust control for screening systems are similar to that for crushers: <ul style="list-style-type: none"> <li>• Enclose or cover screens;</li> <li>• Installation of skirts around transfer points; or</li> <li>• Isolate workers as per crushing plant.</li> </ul> Ensure that screening equipment is designed and installed so as to be easily accessible for maintenance work.
<b>Conveyors</b>	Minimise material spillage from conveyors, particularly at transfer points. Keep conveyor belts clean to avoid carry back by installing scrapers or brushes, or by washing the belt. Enclose transfer points on conveyors. Use of extraction ventilation at transfer points. Reduce fall height to stockpiles through transfer chutes.
<b>Bulk Loading</b>	Wetting down of aggregates using water cart or sprinklers. Enclosed loadout bays. The installation of loading spouts or cones to reduce the falling distance of products. Utilisation of a dust suppression hopper. Installation of wheel washes for vehicles leaving operational areas.
<b>Haul Roads</b>	Seal, regularly water down, or use street sweeper to mitigate wheel generated dust. Watering of haul roads can be improved by using dust suppressants or other treatments, such as surface stabilisers. Installation of water sprays in heavy traffic zones can be more effective than water carts. Ensure speed limits are observed - dust emissions can be reduced by slower vehicle speeds. Ensure all traffic is restricted to marked roadways to avoid driving over surfaces not treated for vehicles.
<b>Laboratory Work</b>	Laboratories should have their own, clean air supply and they should be sealed and physically separated from any adjacent dusty areas. Provide local exhaust ventilation systems for specific laboratory test equipment which may cause or generate dusts. The use of fume cupboards may be appropriate when handling samples of silica flour and other similar materials. Use wet cleaning methods where possible when cleaning laboratory equipment.
<b>General Housekeeping</b>	Avoid the accumulation of dusts in work areas by: <ul style="list-style-type: none"> <li>• Cleaning work areas on a regular basis, including mobile equipment and buildings;</li> <li>• Using vacuums (with HEPA air filters) or wet cleaning methods;</li> <li>• Do not clean up with a dry brush or using compressed air;</li> <li>• Washing down dusty areas before performing scheduled maintenance work; and</li> <li>• Having wet or dry boot washes available for use at amenities/office.</li> </ul> It is particularly important that good housekeeping practices are employed prior to performing maintenance tasks, such as changing screens or conducting maintenance on mobile plant and equipment. Ensure these work areas are clean and free of dust prior to undertaking work in this area. Remember, respirable dust cannot be seen by the naked eye.

Table 3: Common controls for RCS in Quarries.

Controls do not necessarily need to be costly or difficult to implement. As can be seen from the table on the previous page, there are a number of simple, cost effective controls available to industry to manage RCS exposure. By way of an example, the below video link demonstrates the effectiveness of simply keeping control room windows and doors closed by comparing the dust concentrations from an open control room.

 [VIDEO - Crushing of Minerals](#)  
(NESPI The European Network on Silica, 2016)

There are a range of other materials available online that provide further guidance on effective controls for the management of RCS and other airborne dusts.

**USEFUL RESOURCES:**

- [Dust Control Handbook for Industrial Minerals Mining and Processing](#) (National Institute for Occupational Safety and Health, 2012)
- [Good Practice Guide on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products Containing it](#) (NESPI The European Network on Silica, 2006)
- [COSHH essentials in Quarries - Silica Guidance Series](#) (UK Health and Safety Executive, 2017)

### 4.3 Administrative Controls and Personal Protective Equipment

Administrative controls or use of personal protective equipment (PPE) are lower order controls that do not manage the hazard at the source. Instead they rely on human behaviour and supervision to minimise exposure to a hazard.

Administrative controls and PPE should only be used:

- To supplement higher order control measures as a means of further mitigating the risk of exposure;
- As an interim measure until a more effective way of controlling the risk can be used;
- When there are no other practical control measures available (as a last resort).<sup>23</sup>

Examples of administrative controls applied in quarries to minimise exposure to RCS are:

- Scheduling specific tasks when RCS dust generation minimised (i.e. undertaking maintenance activities during shutdowns);
- Reducing the period of exposure through job rotation;
- Reducing the number of people exposed;
- Applying good housekeeping practices (refer to Table 3);
- Use of warning signs, e.g. respirators required in area; and
- Worker education and awareness training.



23 Safe Work Australia, May 2018, p.19



Respiratory Protective Equipment (RPE) is a particular type of PPE, used to protect workers against the inhalation of hazardous substances in the workplace, including dusts. If through the use of higher order controls you cannot reduce exposure to RCS to a safe level (and at minimum below the exposure standard), then you will need to use RPE.

Where RPE is used as a control measure, it is vital that it is adequate and suitable. RPE must reduce exposure to as low as reasonably practicable levels, and in any case to an acceptable level (i.e. at a minimum, below the exposure standard).

For RPE to be suitable it must be matched to the job, the environment, the anticipated airborne contaminant exposure level, and the wearer. The WHS legislation outlines the obligations on the PCBU to ensure that PPE is used effectively. This includes matters such as:

- It is the obligation of the PCBU to provide the RPE;
- RPE should be fit for purpose having regard to the nature of the work and hazard;
- RPE should be of a suitable size and fit to be reasonably comfortable for the worker;
- RPE should be maintained to an acceptable standard to ensure it is clean, hygienic and in good working order;
- Providing the appropriate information and training to workers on how to use, wear, store and maintain RPE; and
- Ensuring that the worker wears the RPE provided.

Likewise, there are obligations on the worker to use and wear RPE in accordance with the information, training and instruction provided and to not intentionally misuse or damage the RPE. There is also an obligation on the worker to inform the PCBU of any damage, defect or need to maintain this equipment.

Different types of RPE are available such as full face mask, powered hood, helmet or blouse model or power-assisted full face mask model. What you choose will depend on your risk assessment. It is important that you choose RPE that will provide adequate protection based on dust concentrations observed at your site. This is known as the required minimum protection factor (RMPF) and can be calculated using the following formula:

$$\text{Required Minimum Protection Factor (RMPF)} = \frac{\text{Worker exposure as time weighted average}}{\text{Workplace Exposure Standard}}$$

All workers needing to wear RPE need to have their basic physiological conditions assessed. Workers with general breathing difficulties, asthma or heart conditions may be unsuited to the use of some types of respiratory protection. Users must also have regular facial fit testing to ensure that a respirator fits and does not leak during use.<sup>24</sup> Being clean shaven is also an important factor in ensuring the effectiveness of a respirator.

Refer to **Australian Standard 1715:2009 Selection, use and maintenance of Respiratory Protective Equipment** for further information on the adequate selection of RPE in the workplace.



## 5. MONITOR THE RISK – PERSONAL EXPOSURE MONITORING

Personal exposure monitoring is the most common method for quantifying the level of RCS exposure to workers on site. It can be used as a means to, firstly, **identify and assess RCS risk**, and secondly, for **ongoing monitoring and verification purposes**, to ensure that the controls in place are effective.

Personal exposure monitoring is conducted to ensure compliance with the exposure standard and to assess the effectiveness of controls in the workplace. Personal exposure monitoring is required to be carried out if:

- The PCBU is not certain on reasonable grounds whether or not the airborne concentration at the workplace exceeds the relevant exposure standard; or
- Monitoring is necessary to determine whether there is a risk to health.

Records must be kept for a minimum of 30 years and must be readily accessible to persons at the workplace who have undergone a possible exposure. Personal exposure monitoring involves sampling of the air the worker breathes (i.e. from their breathing zone) as they conduct their work typically over a full shift, or a representative sample thereof.

### 5.1 Sampling Process for Personal Exposure Monitoring

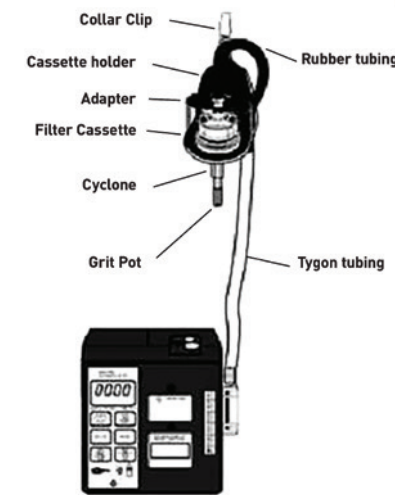


Figure 4: Personal dust sampler

Samples are taken by means of a small battery powered pump worn by the worker. The pump is connected to a piece of plastic hosing connected to the sampling unit which is clipped to the worker's shirt (or in close proximity to the nose and mouth). A steady stream of air is drawn through the sampling unit where the coarse dust is first removed and leaving only the respirable dust.<sup>25</sup>

The RCS concentration of respirable dust is determined in a laboratory via gravimetric infrared spectroscopy or x-ray diffraction analysis. This process identifies how much RCS is present, excluding all other types of dust. The weight of the RCS dust, sample time and pump flow rate are used to calculate a time weighted average airborne concentration to compare against the exposure standard.

The sampling for dust in the workplace must be carried out by a competent person, generally an occupational hygienist or technician and in accordance with **Australian Standard 2985:2009 Workplace Atmospheres - Method of sampling and gravimetric determination of respirable dust**.

The analysis of sample results should also be undertaken by a laboratory with third party technical accreditation (for example NATA) for the method used.



### 5.2 Developing an Exposure Monitoring Program

An exposure monitoring program should be developed for workers or workgroups that have been identified as having an RCS exposure risk. You should engage the services of an expert in personal exposure monitoring, such as a qualified occupational hygienist or technician, to help design, perform and interpret the results of a suitable monitoring program for your site.

In assessing the frequency and types of workers who may need to be included in an ongoing monitoring program, it is important to have a sufficient baseline of data from which to base your decision. Again, an occupational hygienist can advise you on how best to do this taking into account the size and nature of your site and the workforce.

For quarry sites with low concentrations of RCS and low levels of exposure, less frequent monitoring will be required. In these cases, monitoring is likely to be needed as a means of validating and reviewing the original assessment of risk for the site. In these instances, CCAA recommends that RCS monitoring be incorporated intermittently into general inhalable and respirable dust monitoring.

The Queensland Department of Natural Resources Mines and Energy (DNRME) have a dedicated *Guideline for the Management of RCS in Queensland Mineral Mines and Quarries* (the DNRME Guideline). In Queensland, quarry operators are required to follow this guideline in developing an appropriate exposure monitoring program or by following an alternative method; however it must achieve a level of risk equal to or better than the DNRME Guideline. There is no such Guideline in other States.

#### USEFUL RESOURCES:

- [QGL02 - Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries](#) (Department of Natural Resources Mines and Energy, May 2018)

<sup>24</sup> Workplace Health & Safety Queensland, 2013, p.17

<sup>25</sup> Coal Services Pty Ltd, 2016, p.25



In developing an exposure monitoring program for RCS, CCAA recommends consideration of the key matters outlined in the below table:

<p><b>WHAT WORKER/S SHOULD BE MONITORED?</b></p>	<p>Exposure monitoring should be representative of all workers assessed to be at risk of unsafe levels of RCS exposure. Where possible, workers should be randomly selected on the day of monitoring.</p> <p>Depending on the size of the workforce at a quarry and the nature of work tasks, it may not be necessary to assess each worker individually. Instead, workers may be able to be grouped into workgroups otherwise known as Similar Exposure Groups (SEGs).</p> <p>A SEG is a group of workers who have the same general exposure profile due to the similarity and frequency of the tasks they perform, the materials and processes with which they work and the similarity of the way they perform the tasks.</p> <p>For RCS monitoring to be applicable to a whole workgroup or SEG it is important that a statistically representative sample of the workgroup is taken. The advice of an occupational hygienist or technical expert should be used when formulating SEGs and developing a program that ensures a statistically representative sample is taken for each SEG.</p> <p>For smaller sites where work tasks vary significantly from person to person it may not be possible to assign SEGs. Again an occupational hygienist or consultant can advise you on the appropriate course of action.</p>
<p><b>HOW FREQUENTLY SHOULD YOU MONITOR?</b></p>	<p>Exposure monitoring should be undertaken periodically to ensure current control measures in quarries continue to be effective.</p> <p>The frequency of exposure monitoring will depend on the extent of the RCS risk associated with specific workgroups or SEGs.</p> <p>Once you have established a monitoring baseline an occupational hygienist or relevant expert can advise you on the most appropriate monitoring frequency for a worker or workgroup based on the exposure profile.</p> <p>The <b>Queensland</b> DNRME Guideline specifies a minimum number and frequency of samples based on the degree to which a workgroup or SEG is approaching the exposure standard. Queensland operators should refer to this guideline when determining monitoring frequency.</p> <p>In <b>Western Australia</b> the frequency of monitoring must be documented in an operator's Health and Hygiene Management Plan (HHMP) which is reviewed by the Mine Safety Directorate of DMIRS who will assess whether the program of monitoring is adequate.</p>
<p><b>ESTABLISHING AN INTERNAL TRIGGER LEVEL</b></p>	<p>It is advisable to establish an internal exposure trigger level within your organisation/site that is below the exposure standard. An internal exposure trigger level ensures that worker exposure is managed well below the exposure standard. It allows for action to be taken prior to a worker being exposed to unsafe levels of RCS and helps prevent future exceedances of the legal exposure standard.</p> <p>CCAA is aware of a number of member companies who operate with a trigger level of 0.05mg/m<sup>3</sup>, which is 50 per cent of the current exposure standard on an 8 hour TWA.</p> <p>Where this trigger level is exceeded a job based risk assessment would be initiated in order to review the effectiveness of current controls and undertake additional action to ensure RCS exposure is maintained below the trigger level.</p>
<p><b>EXCEEDANCE OF THE EXPOSURE STANDARD</b></p>	<p>If through exposure monitoring it is found that a worker or workers are exposed to levels above the exposure standard, you should:</p> <ul style="list-style-type: none"> <li>• Notify the worker/s;</li> <li>• Undertake an investigation, in consultation with workers, into the cause of the exceedance;</li> <li>• Take action by implementing controls to reduce exposure and prevent further exceedances;</li> <li>• Verify the effectiveness of new controls through follow up monitoring; and</li> <li>• Seek advice from a competent medical practitioner to determine whether health monitoring is required for the worker/s – Refer to Section 7.</li> </ul> <p>Some States may also require that exceedances be reported to the relevant regulator – Refer to Table 2 to see if this is a requirement in your jurisdiction.</p>

Table 4: Key Considerations for Personal Exposure Monitoring

**USEFUL RESOURCES:**

- [Guidance on the Interpretation of Workplace Exposure Standards For Airborne Contaminants](#) (Safe Work Australia, April 2018)
- [Webinar - Workplace Exposure Standards and How to Use Them](#) (Safe Work Australia, 2016)
- [QGL02 - Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries](#) (Department of Natural Resources Mines and Energy, May 2018)

## 6. EMPLOYEE EDUCATION

It is essential that workers and contractors are made aware of the health risks associated with RCS and that they are aware of RCS hazards on site.

Likewise, it is important that they are aware of the controls in place to protect them from RCS exposure and that they are aware of the actions that can contribute to higher levels of exposure, for example leaving windows and doors open.

The following information about RCS hazards should be provided to workers:<sup>26</sup>

- Sources of RCS in the quarry;
- Activities that create RCS risk and noting that a lack of visible dust is not a reliable indicator of RCS risk;
- How RCS may affect workers (i.e. silicosis), noting that no symptoms may be present in the early stages of lung disease;
- Control measures that have been implemented at the quarry;
- Selection, use, storage and maintenance of respiratory protection including respirator fit testing as required;
- Details of the site's dust monitoring program and requirements to undertake health monitoring (where applicable); and
- The duty on the worker to co-operate with the PCBU, use RPE as directed, and participate in monitoring programs.

Induction and refresher training should be provided to quarry workers exposed to RCS.

CCAA has developed a toolbox talk template for initiating a conversation with workers on RCS. **Refer to Appendix A for a copy of CCAA's Toolbox Talk Template for Educating Workers on RCS.**

## 7. HEALTH MONITORING

WHS legislation states that the PCBU must ensure health monitoring is provided to a worker if the worker "is carrying out ongoing work using, handling, generating or storing hazardous chemicals and there is a **significant risk** to a workers health."

Safe Work Australia's *Health Monitoring for Exposure to Hazardous Chemicals - Guide for Persons Conducting a Business or Undertaking* provides guidance on determining whether there is a **significant risk**. Such an assessment relies on a number of factors, but overall the PCBU must determine the degree of exposure in conjunction with the known health effects and the likelihood of risk to decide if a program of health monitoring is necessary.<sup>27</sup>

The risk may generally be described as 'not significant' or 'significant'. The risk can be regarded as 'not significant' if it is **unlikely** the worker will be exposed at a level that would adversely affect his or her health. A 'significant risk' means people in the workplace are **likely** to be exposed at a level that could adversely affect their health.

For example, there would be a 'significant risk' if any of the following applies:

- Exposure is high;
- The substance used is highly toxic; or
- It is reasonably foreseeable that leaks or spills of a hazardous chemical might occur.

**Where there is uncertainty about the risks, health monitoring is generally required.**

If risks from hazardous chemicals are already controlled in accordance with known control measures, including those that may be mentioned in the SDS, the risk is not considered to be significant and health monitoring is not required. For example, where a process is completely enclosed or workers are isolated from exposure, risks would be considered low and health monitoring would not be required.

Figure 5: Extract from Safe Work Australia's – Health Monitoring for Exposure to Hazardous Chemicals - Guide for Persons Conducting a Business or Undertaking.



<sup>26</sup> Department of Natural Resources Mines and Energy, May 2018

<sup>27</sup> Safe Work Australia, *Health Monitoring for Exposure to Hazardous Chemicals - Guide for Persons Conducting a Business or Undertaking*, 2013, pp.4-5



In order to determine whether health monitoring is required quarry operators should:

- Utilise personal exposure monitoring data;
- Assess regular activities associated with the worker's job tasks; and
- Take into account the advice of a competent medical practitioner.

Often an exceedance of the exposure standard or a company's internal trigger level will prompt consideration to be given for that individual to have health monitoring.

**As a guide some regulators have suggested that regular long-term unprotected exposure of workers to greater than 50 per cent of the exposure standard is considered a significant risk and requires review for possible health monitoring.<sup>28</sup>**

The medical practitioner you engage to perform health monitoring will advise on the appropriate program of health monitoring for the individual worker. Health monitoring should be provided at regular intervals as recommended by the appointed medical practitioner. Notably, it is important to perform health monitoring on workers prior to commencing employment, or prior to any change in role that will involve ongoing exposure to RCS and as an exit medical when the worker has either left your employment or when they are no longer at risk of exposure.

Health monitoring will typically involve:

- An assessment of work and medical history;
- A respiratory questionnaire;
- A physical examination;
- A lung function test – such as spirometry;
- A chest x-ray (Posterior to Anterior view) – chest x-rays should be undertaken at frequencies that avoid unnecessary radiation. Report to be recorded according to current International Labour Organisation classification; and
- Any other test deemed pertinent by the appointed medical practitioner.

## 7.1 Duties in Relations to Health Monitoring

The duties of the PCBU in relation to health monitoring include:

- Informing workers of the requirements for health monitoring;
- Using a registered medical practitioner with experience in health monitoring;
- Paying all expenses relating to health monitoring of the worker;
- Providing specific details to the medical practitioner – Name and address of the PCBU, name and date of birth of the worker, the nature of the work, if the worker has started work relevant to the hazard and how long the worker has been doing this work;
- Obtaining a copy of the health monitoring report;
- Providing a copy of the health monitoring report to the worker;
- Providing a copy of the health monitoring report to the relevant regulator if the worker has developed a disease and/or the report contains any recommendations on remedial measures at the workplace;

- Providing a copy of the health monitoring report to any other PCBU who has a duty to the worker in question (where applicable); and
- Keeping records of health monitoring for 30 years.

## 7.2 A Registered Medical Practitioner

It is a requirement that health monitoring be carried out or supervised by a registered medical practitioner with experience in health monitoring.

Before agreeing to participate in a health monitoring program the medical practitioner should ensure they have the necessary experience and competence for this work. Safe Work Australia provides guidance on the kinds of competencies required of the nominated medical practitioner in its document: 'Health Monitoring for Exposure to Hazardous Chemicals: Guide for Medical Practitioners'.

The following state based regulators also provide guidance on identifying suitable providers to undertake health monitoring for occupational lung disease:

- **NSW Resources Regulator** - [Fact sheet: To assist operators in identifying appropriate health monitoring providers for occupational lung disease.](#)<sup>29</sup>
- **QLD Department of Natural Resources, Mines and Energy (DNRME)** - [QGL02 - Guideline for Management of Respirable Crystalline Silica in Queensland Mineral Mines and Quarries, \[Appendix 8\].](#)<sup>30</sup>

DNRME has also introduced a register of medical providers offering health monitoring services such as X-ray imaging and spirometry practices. Doctors and health providers wishing to be added to this register must meet specific criteria set by DNRME before they can be included on the register, to ensure they have the relevant skills and expertise. This register is not confined to Queensland providers so may be useful to quarry operators in other jurisdictions, but is not comprehensive for other states.

### USEFUL RESOURCES:

- [Fact sheet: To assist operators in identifying appropriate health monitoring providers for occupational lung disease](#) (NSW Resources Regulator, 2018)
- [Register of Doctors and Medical Providers](#) (Department of Natural Resources, Mines and Energy, January 2018)
- [Health Monitoring for Exposure to Hazardous Chemicals: Guide for PCBUs](#) (Safe Work Australia, 2013)
- [Hazardous Chemicals Requiring Health Monitoring](#) (Safe Work Australia, 2013)
- [Health Monitoring for Exposure to Hazardous Chemicals: Guide for Workers](#) (Safe Work Australia, 2013)
- [Health Monitoring for Exposure to Hazardous Chemicals: Guide for Medical Practitioners](#) (Safe Work Australia, 2013)
- [Hazardous Chemicals Requiring Health Monitoring](#) (Safe Work Australia, 2013)

<sup>28</sup> Department of Natural Resources Mines and Energy, May 2018, p.12., Australian Institute of Occupational Hygienists Inc, 2009, p.7., and Workplace Health & Safety Queensland, 2013, p.18.

<sup>29</sup> NSW Resources Regulator, 2018

<sup>30</sup> Department of Natural Resources Mines and Energy, May 2018, p.23

## APPENDIX A: Toolbox Talk – Respirable Crystalline Silica in Quarries

**MYTH: 'I don't work with harmful substances'.**

**REALITY: Most businesses work with substances that can be hazardous to health. It is important to understand the risks in your workplace.**

### What is Silica and why is it an issue?

Silica is one of the most abundant minerals in the earth's crust and forms the major component of most rocks and soils.

Crystalline silica is an aggressive, lung damaging dust when it is able to penetrate deep into the lung in sufficient quantity, whereas the non-crystalline form does not cause such lung damage. Respirable crystalline silica or "RCS" is the respirable dust fraction of crystalline silica that can penetrate deep into the lungs. Respirable dusts are often referred to as "invisible dusts" because they are too small to be seen with the naked eye.

**MYTH: 'It's natural so it can't be harmful'.**

**REALITY: Natural materials can be harmful. Respirable crystalline silica can cause lung disease.**

### What should you be concerned about?

Breathing in large amounts of very fine dust of any sort can be potentially harmful; however, particular dusts, like RCS can carry a greater health risk. RCS dust can penetrate deep into the lungs.

The body's natural defence mechanisms may eliminate most of the respirable dust inhaled. However, in case of prolonged exposure to excessive levels of RCS dust, it becomes difficult to clear from the lungs and an accumulation can, in the long term, lead to serious and irreversible lung disease, predominately silicosis.

Early symptoms for silicosis include shortness of breath, a dry cough and a general feeling of ill health. As the disease progresses the symptoms may become more severe and can lead to permanent disablement and early death.

### How can you monitor exposure?

The legal exposure standard for RCS in Australia is 0.1mg/m<sup>3</sup> on an 8 hour shift adjusted time weighted average. It is the duty of the person conducting the business or undertaking (the PCBU) to ensure that workers are not exposed to concentrations above this exposure standard.

Personal exposure monitoring is the most common method for quantifying the level of RCS exposure to workers on site. It samples the air the worker breathes as they conduct their work, typically over a full shift, or a representative sample thereof.

An exposure monitoring program should be developed for workers or workgroups that have been identified as having an RCS exposure risk.

Discuss the nature of the RCS risk in your workplace.

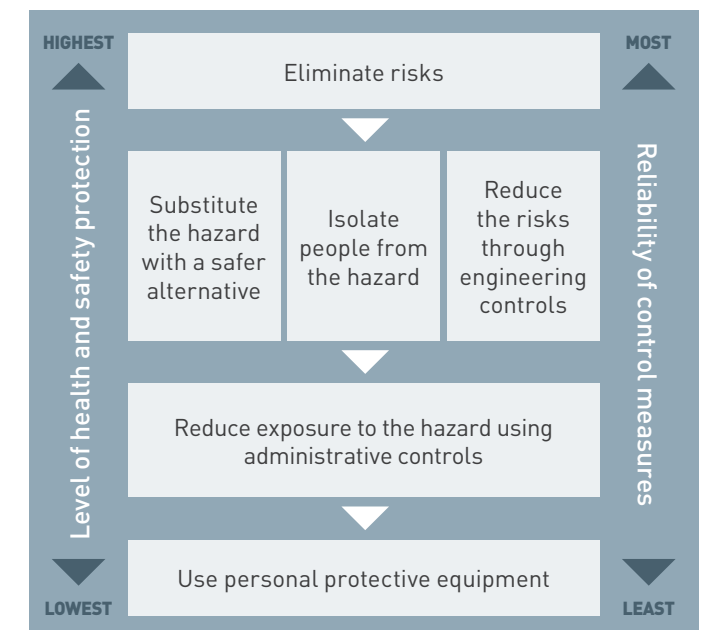
Exercise: Identify tasks that can generate RCS in your workplace:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

### How can RCS be controlled in Quarries?

It is important that RCS exposure in your workplace is reduced and maintained at a safe level and is as low as reasonably practicable.

The *Hierarchy of Control* is a system used to control hazards in the workplace. The best control measure involves eliminating the risk - that is removing the risk from the workplace. If that is not possible you must minimise risks, so far as is reasonably practicable.



When selecting the appropriate control, it is important that the control specifically addresses RCS generating sources. It may be that more than one control is needed to reduce the risk and what is a suitable control for one site is not suitable for others.

Examples of the kinds of controls that can be used to mitigate RCS in quarries are:

- Keep doors and windows closed in vehicle cabins at all times;
- Enclosing dust generating plant, i.e. crushers and conveyers;
- Reduce fall height to stockpiles through transfer chutes;
- Isolate workers in a ventilated control room where possible;
- Provide well maintained air conditioning with a fitted dust filtration system in vehicles and workspaces;
- Wet processing methods and wetting down of stockpiles;
- Seal or regularly water down roadways to prevent wheel generated dust;
- Scheduling specific tasks when dust generation is at a minimum; i.e. during maintenance tasks; and
- Apply good housekeeping practices by using vacuum or wet cleaning methods.

**WATER can keep RCS out of the air, and out of your lungs**  
**EXTRACTION VENTILATION AND VACUUMS can capture the dust right where it starts**

**RESPIRATORS can protect your lungs from dangerous dust**

**MYTH: 'of course its safe – we've always done it this way'.**

**REALITY: Some diseases take years to develop, maybe it's time to change?**

Exercise: What controls are in place in your workplace to manage the risk of RCS exposure?

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

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  16. Department of Mines, Industry Regulation and Safety, N.D
  17. Clause 128(r) of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* requires the reporting of exceedances to the crystalline silica workplace exposure limit as a high potential incident.
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