Respirable Crystalline Silica Dust (RCSD) Management Guideline

Issue 2 – March 2022

Acknowledgements

The CMPA would like to acknowledge those who contributed to the development of this Guideline.
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Disclaimer

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The guidelines here may not apply in all circumstances and should not replace a site manager's considered assessment of a particular situation before them.

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Overview

This Respirable Crystalline Silica Dust (RCSD) Management Guideline together with the CMPA's Work Safely Reference Manual aims to support members in meeting the requirements of the Victorian Occupational Health and Safety (OHS) Act 2004, the OHS Regulations 2017and specifically the OHS Amendment (Crystalline Silica) Regulations 2021.

In doing so, this Guideline will:

- Provide members with appropriate management practices required to minimise potential health risks associated with RCSD arising from extractive industry and concrete recycling operations;
- Provide members with a template they can populate so as to establish a site specific RCSD Hazard Control Plan; and
- Assist members in establishing and maintaining a Work Plan that defines operational activityso as to obtain and sustain an Extractive Industry Work Authority.

It is noted within the Overview of this Guideline that:

- *Without effective training of managers and workers the control of exposure to RCSD will be a continual challenge and likely unattainable;*
- *The standard of housekeeping applied on site is paramount to the control of exposure to RCSD.*

There are many other physical and work practice controls required but without an intimate understanding of the RCSD hazard and its consequence these other controls may not be effective orsustainable, therefore exposure to RCSD may not be controlled.

This Guideline replaces the CMPA RCSD Management Guideline Issue 1 - March 2021 to incorporate the introduction of Duties under the OHS Amendment (Crystalline Silica) Regulations 2021.

Note: Within this guideline contractors shall be referred to as workers.

References and Guidance Materials:

- Safe Work Australia - Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice 28August 2020
- Safe Work Australia – Health Monitoring Guide for Crystalline Silica
- Australian Institute of Occupational Hygienists - Dusts not otherwise specified and OccupationalHealth Issues, Position Paper 2014
- Australian Institute of Occupational Hygienists - Respirable Crystalline Silica and Occupational HealthIssues, Position Paper 2018
- Coal Services Pty Limited, Dust safety in the metals and extractives industries 2nd edition 2016
- Workplace Health and Safety Queensland Silica – Technical guide to managing exposure in theworkplace Work-related disease strategy 2012-2022
- State of Queensland, Silica and the Lung, Version 5 March 2020
- Queensland Department of Natural Resources, Mines and Energy, Guideline for management of respirable dust in Queensland mineral mines and quarries Mining and Quarrying Safety and HealthAct 1999, Version 3 April 2020
- Crystalline Silica Discussion Paper, WorkSafe Victoria, October 2019
- NSW Resource Regulator Dust safety in the metals and extractives industries, 2nd edition
- Respirable Crystalline Silica Safe Work SA https://www.safework.sa.gov.au/workplaces/chemicals-substances-and-explosives/silica
- https://www.dnrme.qld.gov.au/business/mining/safety-and-health/alerts-and-bulletins/mines- safety/management-of-dust-containing-crystalline-silica-quart
- WorkSafe Dust containing crystalline silica in the extractive industry 3 Jan 2020 https://www.worksafe.vic.gov.au/dust-containing-crystalline-silica-extractive-industry
- WorkSafe British Columbia (BC). https://www.youtube.com/watch?v=qBgwDvjs5Zc
- Safe Work Australia Crystalline Silica and Silicosis https://www.safeworkaustralia.gov.au/search/site?search=Crystalline+silica+&sort_by=search_api_relevance&sort_order=DESC
- Australian Standard AS2985-2009 Workplace Atmospheres - Method for sampling and gravimetricdetermination of respirable dust
- Casella Air Sampling Handbook https://www.casellasolutions.com/uk/en.html

Relevant Legislation

- Victorian OHS Act 2004;
- Victorian OHS Regulations 2017;
- Victorian OHS Amendment (Crystalline Silica) Regulations 2021.

Overview of relevant Duties under the OHS Act 2004

Section 21 - Duties of employers to workers:

- Provide and maintain a workplace that is safe and without risks to health;
- Ensure safe use, handling, storage or transport of plant or substances; and
- Provide information, instruction, and training to workers.

Section 22 - Duties of employers to monitor health and conditions:

- Monitor health of workers;
- Monitor conditions at the workplace; and
- Keep information and records relating to the health and safety of workers.

Section 35 - Duty of employers to consult with workers

- Consult with Workers when making decisions that may affect the Worker's health and safety

Overview of relevant Duties under the OHS Regulations 2017

Regulation 144 - Preparation of a Safety Data Sheet (SDS)

- A manufacturer of a hazardous substance must prepare a SDS in accordance with regulation 145 that outlines the content of the SDS before the substance is first supplied to a workplace

Regulation 146 - Review and revision of SDS

- The SDS must be reviewed as often as is necessary to ensure that the SDS contains current and accurate information; and at least every 5 years

Regulation 147 - Duty to provide current SDS

- A copy of the current SDS shall be provided to any person to whom the substance is supplied on or before the first occasion that the substance is supplied to that person; and on request to an employer who proposes to use the hazardous substance at a workplace.

Regulation 148 - Duty to provide revised SDS

- If the SDS is revised under regulation 146 the revised SDS is provided to any person to whom the substance is supplied on or before the first occasion that the substance is supplied to that person after the revision.

Regulation 156 – SDS must be readily accessible

- The current SDS must be readily accessible in appropriate languages in addition to English to any employee who may be exposed to the substance.

Regulation 165 - Exposure standard must not be exceeded

- An employer must ensure that an employee is not exposed to an atmospheric concentration of a RCSD supplied to or generated at the workplace above the exposure standard

Regulation 166 - Atmospheric monitoring

- Atmospheric monitoring shall be undertaken for RCSD if there is uncertainty (based on reasonable grounds) as to whether the exposure standard is or may be exceeded is necessary to determine whether there is a risk to health.

Regulation 167 - Provision of results of atmospheric monitoring

- The results of any atmospheric monitoring for RCSD must be provided as soon as reasonably possible to any employee who has been, or who may be, exposed to the RCSD that is the subject of the monitoring.

Regulation 168 - Records of atmospheric monitoring

- Atmospheric monitoring reports for RCSD must be held by an employer for 30 years.

Regulation 169 - Health monitoring

- Health monitoring shall be carried out for workers who are exposed to substances classified as hazardous substance, e.g. RCSD if it is reasonably likely to have an adverse effect on the employee's health under the particular conditions of work at the workplace

Regulation 171 - Records of health monitoring

- Health monitoring reports must be held by an employer for 30 years.

Overview of relevant Duties under the OHS Amendment (Crystalline Silica) Regulations 2021

Regulation 319G - Manufacturer or supplier to give information about crystalline silica substances

- Provide Information to any person to whom the crystalline silica substance is supplied or on request to an employer who proposes to use the crystalline silica substance at a workplace inclusive of:
  - The proportion of crystalline silica contained in the substance
  - Exposure controls, exposure standards, engineering controls and personal protection information
  - Information relating to the handling and storage of including how the substance may be safely used.

Regulation 319H - Review and revision of information

- Review and, if necessary, revise and redistribute the information referred to in regulation 319G

Regulation 319J - Identification of high risk crystalline silica work

- Conduct a risk assessment to identify whether the crystalline silica process or combination of crystalline silica processes is high risk crystalline silica work; ***or***
- Identify the crystalline silica process or combination of crystalline silica processes as high risk crystalline silica work.

Regulation 319K - Record of high risk crystalline silica work

- If a risk assessment was conducted record how the risk assessment was conducted, the scope of the risk assessment, maintain the risk assessment and make available the risk assessment

Regulation 319L - Crystalline silica hazard control statement required for high risk crystalline silica work

- Establish and implement a crystalline silica hazard control statement and ensure all work is performed in accordance with the statement.

Regulation 319M - Crystalline silica hazard control statement to be reviewed and revised

- Review and, if necessary, revise the crystalline silica hazard control statement whenever the work changes or if there is an indication that risk control measures are not controlling the risks adequately, including after any incident that occurs during high risk crystalline silica work

Regulation 319N - Copy of crystalline silica hazard control statement to be kept

- Maintain a copy of the crystalline silica hazard control statement for the duration of the high risk crystalline silica work for which the statement has been prepared.

Regulation 319O - Analysis of material to be used in quarrying or tunnelling process

- Collect samples of materials to be used in the quarrying process and arrange for analysis of those samples by a suitably competent person to identify the proportion of crystalline silica contained in each sample.

Regulation 319Q - Information to job applicants

- Provide information to any job applicant who will be engaged in or exposed to high risk crystalline silica work in regards to the health risks associated with exposure to crystalline silica dust and the need for and details of measures to control those risks.

Regulation 319R - Information, instruction and training for workers

- Provide information, instruction and training in the health risks associated with exposure to crystalline silica dust and the need for and proper use of any risk control measures required under these regulations and how the risk control measures are to be implemented.

WHS Responsibilities

As stated in the previous section of this guideline there are many specific Workplace Health and Safety dutiesunder the OHS Act and the OHS Regulation specific to the control of RCSD hazards.

Depending on the workplace management arrangements these duties, i.e., responsibilities may be allocated tovarious persons, e.g., the Quarry Owner (Work Authority holder), Business Owner, Site Manager or Supervisor, OHS Representative or other workers.

It is important that these responsibilities are documented within position descriptions, responsibility statements or other documents. A review of the progress in enacting these responsibilities should be conducted on an annual basis or post monitoring where results identify exposure levels equal to or above theexposure standard.

All managers or workers with RCSD hazard control responsibilities should undertake RCSD Awareness Training toassist them in not only enacting their responsibilities but understanding the importance of those responsibilities.

Due Diligence Requirements

Company Directors, have a duty to exercise due diligence to ensure that the business complies with the OHS Act and Regulations.

Due diligence is defined as taking reasonable steps to:

- Acquire and keep up to-date knowledge of WHS matters;
- Maintain an understanding of the nature of the operations, inclusive of hazards and risks ;
- Ensure appropriate resources and processes to eliminate or minimise risks to health and safety are available and used;
- Ensure appropriate processes for receiving and considering information regarding incidents, hazards and associated risks and responding in a timely way;
- Implement processes for complying with any duty or obligation under WHS legislation; and
- Verify the provision and the use of the resources and processes referred to above.

In summary, Directors must undertake all reasonable steps to ensure that the business has and uses appropriate resources and processes to eliminate or minimise risks that arise from dust hazards.

What does Reasonably Practicable mean?

Section 20 of the Victorian OHS Act 2004 sets out what is meant by "so far as is reasonably practicable" and lists five matters that require consideration and must be taken into account:

- The likelihood of a worker being exposed to harm;
- The potential seriousness of that harm;
- What is known, or ought to be known, about the risk;
- How to eliminate the risk, and
- The availability, suitability and the cost of eliminating or reducing the risk

Dust Definition

Dust is a generic term used to describe fine particles (< 1 to 100 microns) that are suspended in the atmosphere and can be inhaled.

Within the Construction Materials Industry, asides from dust arising from surface soil, dust is generated through mechanicaldisintegration of solids, i.e., drilling, blasting, and crushing of hard rock.

Uncontrolled dust is known as an airborne contaminant and can be:

- Hazardous to personal health; but
- Is also a visual hazard, an ingress hazard, a permeation hazard and a slip hazard

Dust that can be inhaled (<1 to 100 microns in particle size) is known as Inhalable Dust.

Within in Inhalable Dust there is potentially depending on the rock source a Respirable Fraction, being the dust (0.2 - 7 microns in particle size) that is small enough to penetrate past the upper respiratory tract and deep into the lungs.

Dust Measurement, Weight & Classification

Dust particles are generally measured in microns/ micrometres using the symbol µm:

- 1 millimetre (mm) = 1000 microns
- A human hair is approximately 50 microns
- Respirable dust is invisible being less than 7 microns

Dust particles are generally weighed as milligrams (mg) or micrograms using the symbol µg:

- 1000 grams = 1 kilogram
- 1000 milligrams = 1 gram
- 1000 micrograms = 1 milligram

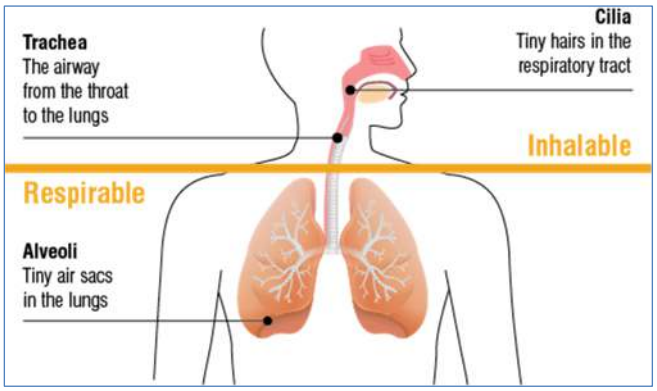
From an occupation perspective dust is typically classified as follows:

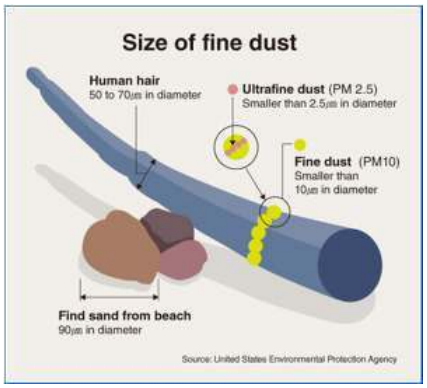
Inhalable Dust

- Dust particles below 100 microns that are trapped in the nose, throat, and upper respiratory tract

Respirable Dust

- Dust particles small enough (0.2 - 7 microns) to penetrate past the upper respiratory tract and deepinto the lungs.





Respirable Crystalline Silica Dust (RCSD)

Crystalline silica is the scientific name for a group of minerals composed of silicon and oxygen i.e. Silicon dioxide (SiO2). There are many types of crystalline silica, but they are generally Quartz, Cristobalite, Tridymite and Tripoli.

Quartz being the most common form is one of the most abundant minerals in the earth's crust.

There are crystalline and non-crystalline forms of silicon dioxide. The non-crystalline form of silica (amorphous)that is widely used in electronics does not cause lung damage.

A Crystalline Silica Substance means any substance that:

- Contains more than 1% crystalline silica; and
- Is reasonably likely to be mechanically processed at a workplace; and
- Is not in a respirable form;

Crystalline Silica as quartz when crushed, ground, drilled or cut generates dust particles that are small enoughto penetrate deep into the lungs. These particles are deemed respirable e.g., RCSD and can cause lung damage. They are often referred to as invisible dusts because they are too small to be seen with the naked eye and are classified as a Hazardous Substance by Safe Work Australia.

Rock when crushed, ground, drilled or cut may generate RCSD.

Common Rock and Materials Sources Containing Quartz

The largest amount of quartz is contained in igneous rocks, in particular in granitoids, granites and relatedrock. Very high concentrations of quartz can be found in certain sedimentary rocks like sandstone, as well as inalluvial and marine sands. Metamorphic rocks also show large variations in quartz content. The quartz content often reflects the mineralcomposition of the precursor rock.

Typical Quartz Contents	
Manufactured Stone *	>95%
Waste Concrete	>90%
River Pebble	>90%
Sandstone	70 – 90%
River Pebble	70 – 80%
Hornsfels	35 - 60%
Siltstone	45%
Granite	25 - 40%
Fly Ash	> 30 %
Brick	> 30%
Clay	20 - 30%
Shale	22%
Ignimbrite	>21%
Fly Ash*	> 5% and varies
Marble	2%
Scoria	0.5 - 2.0%
Portland Cement	> 1% and varies
Trachyte	< 1.0%
Basalt	< 1.0%

** Manufactured Stone also contains pigments to colour and synthetic polymers to bind such as polyester resins.*

** Fly ash is a fine gray powder consisting mostly of spherical, glassy particles that are produced as a byproduct in coal-fired power stations. Fly ash has pozzolanic properties, meaning that it reacts with lime to form cementitious compounds. It is commonly known as a supplementary cementitious material and is classified as a Hazardous Substance by Safe Work Australia*

Quartz Content versus RCSD Exposure:

The quartz content of a rock source as listed above is defined as the total % of quartz in any rock sample.

The level of potential RCSD exposure is influenced by many other factors as well as quartz content, inclusive ofprocessing methods, product type (aggregates or crushed rock), adopted controls such as containment, collection or suppression, and importantly education and housekeeping.

Determination of Quartz Content

The quartz content of rock can be determined by conducting either a Petrographic Analysis or an X-ray Diffractionof representative samples of the rock source within the quarry.

Rock sources with quartz (crystalline silica) content greater than 1% when mechanically processed e.g. crushed, ground, drilled or cut and generate respirable dust are classified as a Hazardous Substance by Safe Work Australia.

Petrographic Analysis:

A Petrographic Analysis is an in-depth investigation of the chemical and physical features of a particular rock sample and is conducted by a Petrographer within a Mineralogy Laboratory and outlines the mineral contentand the textural relationships within the rock sample.

Petrographic Analysis is conducted using a scanning electron microscope (SEM) to characterize the fracture surfaces from microstructures of the rock samples with energy dispersion X-Ray analysis to identify exact mineral assemblages of a rock. X-Ray diffraction can also be used where particle size analysis is not required.

Identification : Psammopelitic hornfels

Description :

The sample consisted of about 1 kg of clean, hard, robust, angular fragments (intermediate diameters about 6 to 12 mm) of finely crystalline, metamorphic rock. When a subsample was sorted it was seen to consist of 94% dark grey, unweathered fragments of hornfels, 3% dark grey fragments of hornfels with joint surface controlled brown, limonitic staining attributable to quite slight weathering and 3% light grey aplite (felsic microgranite).

A thin section was prepared to permit detailed examination in transmitted polarised light of 17 random fragments. An approximate average mineralogical composition of the aggregate, expressed in volume percent and based on a brief count of 100 widely spaced observation points falling within the sectioned random fragments, is :

34%	quartz
42%	biotite mica
19%	muscovite mica
3%	chlorite
2%	feldspar
<1%	opaque grains (probably ilmenite and magnetite)
trace	sulphide
trace	limonite
trace	other minerals (tourmaline and zircon)

Example of a Petrographic Analysis Finding

X-ray Diffraction:

X-ray diffraction analysis is an easy, reliable and economical way to ascertain the presence and quantity ofquartz in a rock sample.

Minute changes in the crystallization system can cause significant changes in the sample that may not bedetectable by chemical analysis or microscopy, e.g., Petrographic Analysis.

To obtain more accurate data, particularly for quantification, the sample should be ground (micro milled) toparticle sizes usually less than 10 µm.

The powdered sample is carefully mounted in the appropriate holder, and then inserted into the X-raydiffractometer.
The scattering of X-rays by the atoms of a crystal produces an interference effect so that the diffraction pattern provides information on the structure of the crystal or the identity and quantity of a crystalline quartz substance.

Figure 1 – Quantitative XRD results

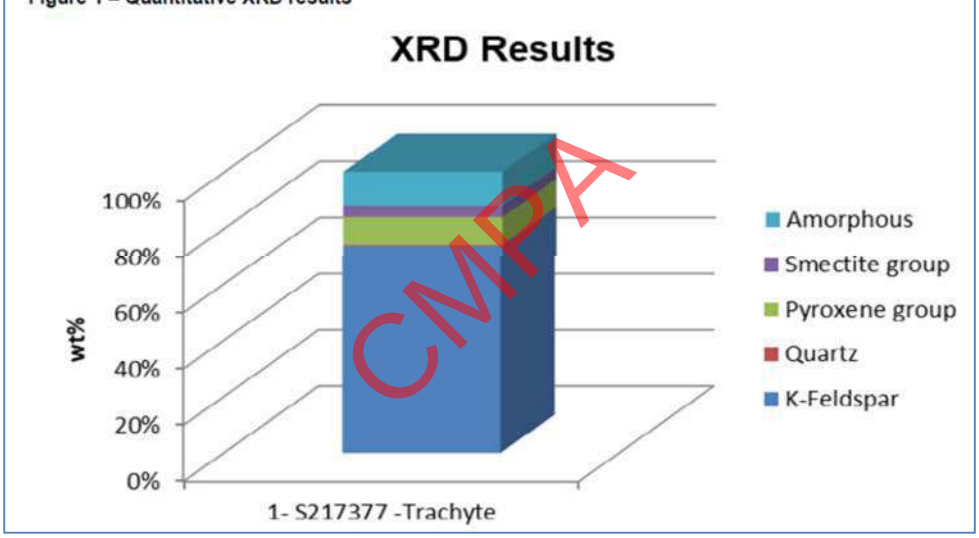


Table 2 - Quantitative XRD results

Mineral	Composition	1- S217377 -Trachyte
K-Feldspar*	$KAlSi_3O_8$	74
Quartz	SiO_2	<1
Pyroxene group*	ABZ_2O_6	10
Smectite group*	$X_{0.3}Y_{2-3}Z_4O_{10}(OH)_2.nH_2O$	4
Amorphous	Unknown	12
Total		100

Example of X-ray diffraction Analysis Finding

Variation of Rock Source Samples:

As a quarry extracts rock from different locations the characteristic of the rock may change. It is important tomaintain controls based on the highest level of quartz content identified.

Provision of Information

The OHS Amendment (Crystalline Silica) Regulations 2021 requires the manufacturer or supplier to provide information about Crystalline Silica Substances to any person to whom the substance is supplied to or on request to an employer who proposes to use the substance at a workplace.

The information must be inclusive of:

- The proportion of crystalline silica (quartz) contained in the substance
- The exposure standards for the substance
- The controls following the Hierarchy of Controls to either eliminate or reduce the risk associated with exposure to the substance far as is reasonably practicable
- Information relating to handling and storage

The CMPA recommends that members who are processing rock or other material with quartz content greater than 1% establish and distribute a product information sheet, similar to a Safety Data Sheets for these products so as to provide this information.

Safety Data Sheets (SDS) for Hazardous Substance

RCSD is classified as a hazardous substance by Safe Work Australia. Hazardous substances are those that, following worker exposure, can have an adverse effect on health.

Under the OHS Regulations 2017 a manufacturer and supplier of a hazardous substance has an obligation,before first supplying the substance to a workplace, to determine whether it is a hazardous substance and, if so to establish a Safety Data Sheet (SDS) for that hazardous substance.

An SDS is a document that provides information on the properties of hazardous substances, how they affecthealth and safety in the workplace and how to control the risks associated with the hazardous substances in the workplace.

An SDS complying with the Hazardous Substance regulation (r.145) is required if a member supplies material in a respirable form, such as silica flour.

Safety Data Sheets for Hazardous Substances must be:

- Provided to the company or person purchasing the hazardous substance;
- Be accessible to all workers handling or exposed to the hazardous substance; and
- Reviewed and amended whenever necessary to ensure that it contains correct, current informationand at least every 5 years.

Job Applicants

The OHS Amendment (Crystalline Silica) Regulations 2021 requires employers or self-employed persons to provide information to any job applicant who will be engaged in or exposed to High Risk Crystalline Silica Work in regards to the health risks associated with exposure to crystalline silica dust and the need for and details of measures to control those risks.

A statement as listed in the below attachment if included in the job advertisement or referred to as a link to your company website in the job advertisement would provide this information.

Refer Attachment H) Provision of Information for Job Applicants

Exposure Standards

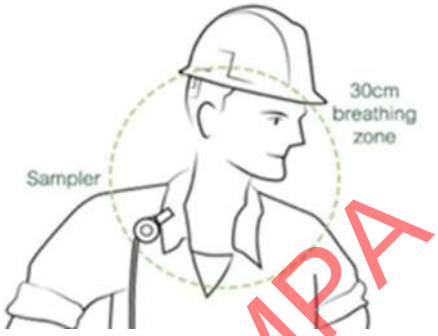
Workplace Exposure Standards

Safe Work Australia (SWA) set exposure standards for hazardous substances which are then adopted by thestate or territory Work, Health and Safety regulatory authorities such as WorkSafe Victoria.

Exposure standards are based on the airborne concentrations of individual substances that, according to current knowledge, should neither impair the health of, nor cause undue discomfort to, nearly all workers.They do not represent a fine dividing line between a healthy and unhealthy work environment.

Exposure standards are measured at the persons breathing zone

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.



Exposure standards are measured by milligrams of substance within a cubic metre of air.

On 1 July 2020, the exposure standard for RCSD was reduced to 0.05 mg/m^3.

Action Levels:

The objective on an action level is to trigger actions to control exposure ensuring all worker exposures staywell below the exposure standard.

WorkSafe has adopted an action level of 0.02 mg/m^3 for RCSD that is just below 50% of the SWA exposure standard.

Time Weighted Average (TWA):

TWA is the average airborne concentration of a particular substance when calculated over a normal eight hour workday, for a five day working week, i.e., 40 hour week. If normal shift durations are greater than 40 hours per week the exposure standard is reduced.

To ensure the exposure standards and action levels are representative of the time worked, many formulascan be used to establish the TWA. In simple terms to adjust the exposure standard to a 50 hour week the following calculation is used.

0.05 mg/m^3 X (40 hours divided by 50 hours) = 0.04 mg/m^3.

RCSD Monitoring and Measurement

Objective of Workplace RCSD Monitoring

The primary objective of personal RCSD monitoring is to identify a worker's exposure to RCSD so as controlscan be established to either eliminate or reduce the exposure.

Personal RCSD monitoring is also utilised to identify, improvements, deteriorating trends and review andaddress controls.

The objective of static RCSD monitoring is used at time to identify sources and volumes of dust being releasedinto the workplace or alternatively to assess the effectiveness of controls once those controls have been established, e.g., before and after.

It must be noted that the results of static RCSD monitoring do not necessarily reflect a worker's exposure tothat RCSD as the worker may not spend any or little time in the area where the static RCSD monitoring wasconducted.

Planning Personal RCSD Monitoring

Planning of personal RCSD monitoring should be conducted by a qualified Occupational Hygienist inconsultation with the responsible manager and worker representative.

The Occupational Hygienist should have proven experience in RCSD monitoring of quarries and hold AIOHProfessional Grade membership. CMPA has associate members who are Occupational Hygienists and undertake RCSD monitoring.

The selection of workers who shall be monitored shall be based on their potential exposure.

Industry wide measurement and analysis prove that in a well-managed quarry, workers with the most potential exposure to RCSD are working in and around the fixed plant, being plant/pugmill operators andmaintenance/cleaning personnel.

The standard of housekeeping applied on site generally determines the likelihood of other potentialexposures.

If mobile equipment operators apply basic controls inclusive of the following potential exposures will be significantly reduced:

- Removal of overalls, removal of dirty boots prior to entering the cabin;
- Regularly vacuuming cabins with Industrial HEPA filter vacuum or class M vacuum and/or wet wiping cabins;
- Maintaining and cleaning air conditioner filters; and
- Keeping cabin windows closed.

Note:

- A HEPA filter is a high efficiency particulate air filter, designed to remove 99.97 percent of all particles that are 0.3 microns in size that pass through it. The HEPA vacuum must be an industrial vacuum.
- A class M vacuum has a filtration efficiency of 99.9% and is recommended as the preferred choice for those upgrading or purchasing a new vacuum.

When identifying potential or actual RCSD hazards present on site and who may be exposed the following should be taken into account:

- Where materials are disturbed or carried to;
- Work practices where workers are confined to or contained within enclosed areas;
- The results of any previous monitoring;
- Crusher runs for specific aggregates/crushed rock mixes;
- Process changes on site e.g., introduction of a bagging product process within a shed;
- Hazard reports regarding RCSD release and or exposure; and
- Consultation with workers.

When scheduling a date for RCSD monitoring the following should be taken into account:

- The advice of the Occupational Hygienist;
- Weather conditions should be as reasonably representative as possible and not extreme, e.g., highrainfall, overly humid, stronger than normal winds, higher than normal temperatures; and
- Operating conditions, e.g., normal production outputs (tonnes per hour), typical crusher runs; notshut down days for maintenance unless planned to specifically monitor maintenance workers.

The responsible manager should ensure on the day of monitoring:

- All existing RCSD controls are in place and operating as they normally do;
- Workers have been informed of the monitoring program and have been briefed as totheir role in the program;
- The Occupational Hygienist is fully inducted to the site and introduced to relevant workers.

The following factors can potentially influence the monitoring result and the worker's level of exposure:

- Ambient condition, for example wet or dry, temperature, relative humidity, air movement, wind;
- Work location and worker activity;
- Operating conditions, e.g., abnormal occurrences, dust spill;
- Influence of nearby activities e.g., rock breaker, grading haul road;
- Influence of neighbours activities, e.g., construction, demolition, materials processing;
- Stripping and moving overburden;
- Dust suppression and control equipment being operational or not;
- Breakdowns and blockages.

To undertake RCSD monitoring the worker carries a small battery powered pump affixed to the trouser belt.

The pump is connected to a sampling unit (or cyclone) with a piece of plastic hosing that contains a filter.The sampling unit is clipped to the workers shirt collar within their breathing zone.

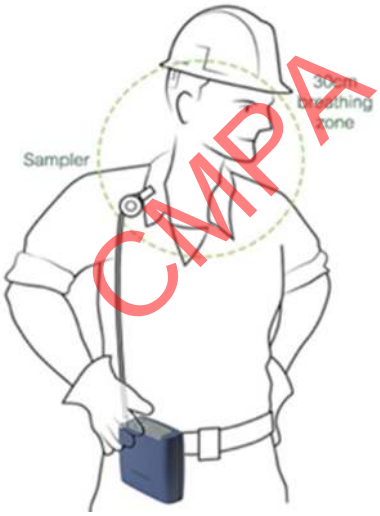
The pump and sampling unit will be fitted by the Occupational Hygienist and should be worn for the durationof the shift to ensure coverage of all activity in that shift.

A steady stream of air is drawn through the sampling unit where the coarse dust settles out and only the veryfine respirable dust is collected on a filter.

Following the air monitoring post weighing of the filters is performed. For quartz determination, the dust onthe filters is analysed by X-ray diffraction (XRD) or by Fourier-transform infrared spectroscopy (FTIR).

The airborne concentration is calculated from the quartz weight and air sampling volume (determined from the duration of the monitoring and the flow rate). The result is then compared to the exposure standard.

This analysis must be carried out by a NATA accredited laboratory for the analysis of crystalline silica.



The Occupational Hygienist should complete a Field Monitoring Report for each worker being monitoredthat:

- Outlines the activities the worker was involved in, the amount of time and the sections of the site theworker accessed and any other factors that have the potential to influence results/exposures;
- Assists in making a risk-based decision as to whether a further controls are required;
- Records all information required to establish a RCSD Management Data Base.

Refer Attachment A) Field Monitoring Report

Note: The use of a body camera worn by the worker during the monitoring period would assist in understandingmore accurately where the worker has been and what activities were undertaken.

RCSD Monitoring Reports

The Occupational Hygienist shall arrange for collected samples to be assessed at a NATA accredited laboratoryfor the analysis of RCSD.

The assessment of total airborne respirable dust shall be performed in accordance with Australian StandardAS2985 - Workplace Atmospheres - Method for sampling and gravimetric determination of respirable dust.

The Occupational Hygienist shall prepare a RCSD Assessment report based on the findings of the assessmentand forward that report to the responsible manager.

Within the report tabled below the Exposure Standards - mg/m^3 has been adjusted to align with hours workedranging from 55 hours (0.036 mg/m^3) to 66.5 hours (0.030mg/m^3). All exposures were below the TWA exposure standard.

Table 3: Results of Airborne Personal Respirable Crystalline Silica Monitoring (11th, 12th and 17th March 2020)

	Location		Result				
Date	Name	Position / Task / Machinery Type	Sample Number	Duration	Total Respirable Dust (mg/m^3)	Respirable Crystalline Silica (mg/m^3)	Applicable (adjusted) SWA Silica Exposure Standard[2] (mg/m^3)
11th March 2020		Dump truck operator	S218226	0715-1553	0.04	<0.02[1]	0.030
11th March 2020		Maintenance	S218227	0718-1330	0.24	<0.02[1]	0.033
11th March 2020		Supervisor	S218220	0720-1512	0.03	<0.02[1]	0.033
11th March 2020		Sales Loader / water cart operator	S218230	0723-1459	0.05	<0.02[1]	0.030
12th March 2020		Excavator operator	S218206	0949-1907	0.02	<0.02[1]	0.033
12th March 2020		Sales Loader	S218341	0946-1906	0.08	<0.02[1]	0.033
17th March 2020		Maintenance	S218364	1459-2259	0.10	<0.02[1]	0.036
17th March 2020		Maintenance	S218363	1506-2300	0.03	<0.02[1]	0.036

Mg/m³ - milligrams of contaminant per cubic metre of sampled air.

(1) - Crystalline silica not detected above the detection limit. The concentration has been calculated based on the stated detection limit of 20 micrograms total for each sample.

(2) - SWA Exposure Standard has been adjusted on the basis of employee working hours as advised.

The responsible manager in consultation with the OHS Representative where applicable, must communicate the results of the report as soon as practical with all relevant workers. A record of the communication should be held. The report should be made accessible to workers to review upon request.

A copy of the RCSD Monitoring Report should be shared with medical practitioners who are conducting health surveillance for workers.

RCSD Monitoring Reports should be held for 30 years post-date of monitoring or unless otherwise stated byWorkSafe.

Frequency of Workplace Monitoring

The OHS Regulation directs that to ensure exposures remain below the exposure standard employers mustcarry out monitoring for hazardous substances (RCSD) generated at their workplace where:

- There is uncertainty about whether the exposure standard is or may be exceeded;
- It is necessary to determine whether there is a risk to employee health, and therefore if healthmonitoring and further controls are required.

The OHS Regulation does not direct a specific frequency of monitoring.

The responsible manager should consult with the Occupational Hygienist to determine the appropriatefrequency of RCSD monitoring based on the previous results and operational activities.

Sites may elect to conduct another round of RCSD monitoring where an exposure has exceeded the exposure standard and controls have since been established to reduce that exposure. The purpose of thissecond round is to validate the effectiveness of those controls.

Workplace Exposure Groups

Where the quarry or business owner has more than one site, the categorisation of monitoring results into similar exposure groups may enable an efficient means of benchmarking the monitoring results.

Similar exposure groups list the various operational roles undertaken in atypical quarry and identify those roles by title and code, such as the example below:

- Q1 Driller;
- Q2 Face Loader Operator;
- Q3 Primary Haul Truck Operator;
- Q4 Crusher Operator;
- Q5 Sales Loader Operator;
- Q6 Bin Truck Operator;
- And so, on up to Q21.

These titles and codes should be applied as relevant to the persons being monitored in Attachment A-FieldMonitoring Report.

Recording RCSD monitoring results under similar exposure groups allows easy identification of whatoperational roles are more likely to be exposed.

Refer Attachment B) Similar Exposure Groups

RCSD Management Data Base

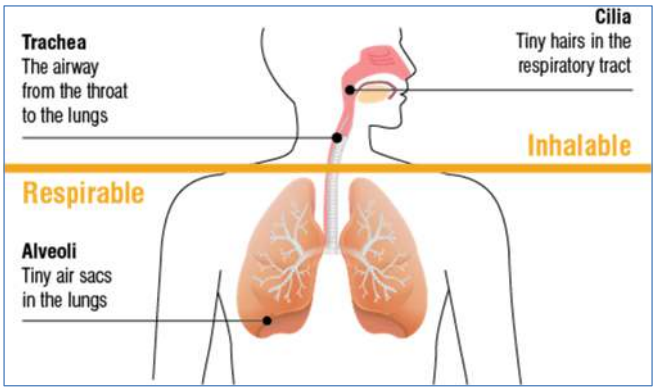
The RCSD Management Data Base is utilised to record and analyse in a collective manner all informationrelevant to the RCSD monitoring results as reported in the Field Monitoring Report.

This can be a helpful analysis tool for multisite operations.

Refer Attachment C) RCSD Management Data Base

Exposure to RCSD - Health Effects and Surveillance

The Respiratory System



The respiratory system is made up of the nose, throat and lungs.

It takes in 5 litres per minute of air while the individual is at rest, and up to 20 litres per minute while working or exercising.

The lungs are protected by a series of defence mechanisms in different regions of the respiratory tract.

When a person breathes in, particles suspended in the air enter the nose, but not all of them reach the lungs. The nose is an efficient filter. Most large particles are stopped in it, until they are removed by blowing the noseor sneezing.

Some of the smaller particles e.g., RCSD succeed in passing through the nose to reach the windpipe and thedividing air tubes that lead to the lungs.

These tubes are called bronchi and bronchioles. All of these airways are lined by cells. The mucus they producecatches most of the dust particles. Tiny hairs called cilia, covering the walls of the air tubes, move the mucus upward and out into the throat, where it is either coughed up and spat out, or swallowed.

The air and respirable dust reach the tiny air sacs (alveoli) in the inner part of the lungs that avoided the defences in the nose and airways. The air sacs are very important because through them, the body receivesoxygen and releases carbon dioxide.

RCSD that reaches the sacs and the lower part of the airways where there are no cilia is attacked by special cells called macrophages. These are extremely important for the defence of the lungs. They keep the air sacs clean. Macrophages virtually swallow the particles. Then the macrophages, in a way which is not well understood, reach the part of the airways that is covered by cilia. The wavelike motions of the cilia move themacrophages which contain dust to the throat, where they are spat out or swallowed.

The most significant reactions of the lung occur in the deepest parts of this organ. Particles that evade elimination in the nose or throat tend to settle in the sacs or close to the end of the airways. But if the amountof RCSD is large, the macrophage system may fail. RCSD particles and dust-containing macrophages collect in the lung tissues, causing injury to the lungs.

The amount of RCSD and the kinds of particles involved influence how serious the lung injury will be.

For example, after the macrophages swallow silica particles, they die and give off toxic substances. Thesesubstances cause fibrous or scar tissue to form. This tissue is the body's normal way of repairing itself.

However, in the case of RCSD so much fibrous tissue and scarring cause the lung function to be impaired.

The general name for this condition is fibrosis.

When fibrosis is caused by RCSD, the condition is called Silicosis.

For a practical illustration of how macrophages work please refer to the following video courtesy of WorkSafe British Columbia (BC).

https://www.youtube.com/watch?v=qBgwDvjs5Zc

Silicosis:

Silicosis is a disease that occurs as a result of the body's own defence mechanisms trying to remove the RCSDfrom deep in the lungs. It causes irreversible scarring, known as fibrosis. As more fibrosis occurs, gas exchangethrough the lungs is reduced which makes breathing more difficult. Silicosis will also increase the risk of lung infection.

Silicosis is an irreversible, progressive condition and in severe forms can result in respiratory failure causingdeath.

Evidence suggests RCSD interacts with other respiratory hazards, like tobacco smoke, to cause airway diseases.

There are three types of silicosis:

- **Acute silicosis:** is very rare and results from very large amounts of exposure to RCSD over a very shorttime (less than one year, may be weeks or months);
- **Accelerated silicosis:** results from short term exposure to large amounts of RCSD (1 to 10 yearsexposure)—this was once rare but is now being seen in engineered stone benchtop workers;
- **Chronic silicosis:** results from long term exposure (10+ years of exposure) to low levels of RCSD.

Other Potential Health Issues Associated with Dust Exposure

Please note: All RCSD related diseases can be prevented by adopting effective controls to reduce the volumeof RCSD in the workplace and exposure to that RCSD.

Irritation:

RCSD can irritate the eyes, skin, nose, and upper throat, leading to watery eyes, itchy nose and throat, drycough and rough skin. Excessive levels may scratch the eye lens leading to vision impairment.

Dermatitis:

Repeated heavy contact to the skin may cause drying of the skin and can result in dermatitis, an allergicreaction that is manifested by one or more lines of red, swollen, blistered skin that may itch or seep.

Bronchitis:

Excessive exposure to RCSD can cause the airways to become inflamed due to constant irritation by the RCSDe.g., bronchitis. This can lead to breathing difficulties and causes persistent coughing.

Emphysema:

Emphysema is a lung condition that causes shortness of breath. In people with emphysema, the air sacs in thelungs (alveoli) are damaged. Over time, the inner walls of the air sacs weaken and rupture — creating larger air spaces instead of many small ones. This reduces the surface area of the lungs and, in turn, the amount of oxygen that reaches the bloodstream.

Chronic Kidney Disease:

Chronic Kidney Disease is a decline in kidney function that may require dialysis if severe.

Scleroderma:

Scleroderma is an autoimmune disease of the connective tissue causing scar tissue formation in the skin, jointsand other organs.

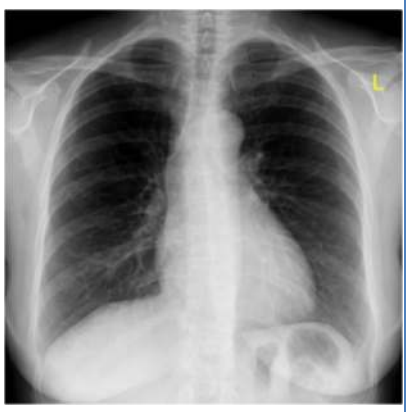
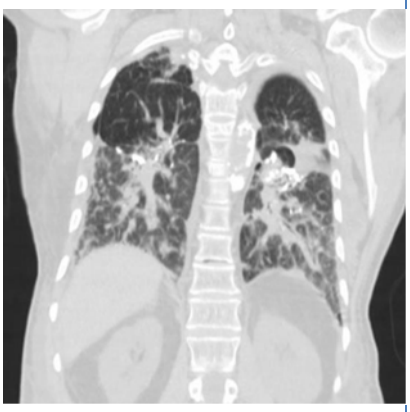
Rheumatoid Arthritis:

Rheumatoid Arthritis is an autoimmune disease causing joint pain and swelling.

Carcinogenicity:

On 19 December 2019 Safe Work Australia amended the Advisory Carcinogen Category for Cristobalite, Quartz, Silica – Crystalline, Tridymite and to Carcinogen 1A.

Safe Work Australia Advisory Carcinogen Category	
Category	1A (Carc. 1A) Known to have carcinogenic potential for humans
	1B (Carc. 1B) Presumed to have carcinogenic potential for humans.
	2 (Carc. 2) Suspected human carcinogen.

Courtesy of the State of QLD, document titled Silica and the Lung. Version 5 March 2020		
		
Chest X-ray showing healthy lungs in a 45-year old.	Chest X-ray showing silicosis with progressive massive fibrosis in a 45-year old stone mason.	Chest CT scan showing silicosis with progressive massive fibrosis in a 64-year old former sand blaster.

Worker's Compensation Statistics:

Worker's compensation statistics indicate there are very few new cases of silicosis arising from the extractive industries in Victoria but there has been a significant surge in cases arising from the engineered/manufactured stone industry.

Of the 355 worker's compensation claims received from1 July 2016 – 5 September 2019 for health issues associated with RCSD, 6 claims only arose through the category titled as gravel and sand quarrying operations, and 2 claims in the Other construction material mining category. 2 historic claims exist, lodged prior to 2016.

It is understood that the 4 claims have arisen through the processing of high purity quartz sands in a contained environment at the one site.

Health Surveillance

Overview:

Employers must provide health monitoring for any workers exposed to RCSD at levels likely to exceed theexposure standard.

WorkSafe has adopted an action level of 0.02 mg/m^3 for RCSD that is just below 50% of the SWA exposure standard.

The health surveillance regime should begin at the pre-employment stage, be ongoing at required intervalsduring the course of employment and conclude on termination of employment.

Prior to the health surveillance appointment, you must provide specific details to the medical practitioner as follows:

- Name of the employer;
- Name and date of birth of the worker;
- The nature of the work the worker undertakes and how long the worker has been doing this work;
- The levels of RCSD the worker has been exposed to.

Health Surveillance Resources:

CMPA Medical Practitioner Guidelines and Medical forms are available at www.cmpavic.asn.au

These guidelines and medical forms are designed to assist employers who operate construction material processing businesses in meeting the requirements of the *OHS Act 2004* and itsRegulations in relation to monitoring their workers' health.

Pre-employment health assessment - the objectives are to determine whether an employee is fit for theproposed job and to obtain a baseline assessment for future health monitoring.

Periodic health monitoring - is aimed to assess at the earliest opportunity the detrimental effects on ongoingworkers from the identified construction material processing hazards but also to assess those workers with a medical condition that may expose them or other workers to risk to their health.

Silica specific periodic health monitoring –

Periodicity of health monitoring in regard to RCSD will be determined by the results of personal exposurelevels:

- For those workers who are exposed to crystalline silica (i.e., > 0.02 mg/m^3), health monitoring should include spirometry and a medical examination every year and a chest x-ray every 4 years;
- For those workers who are exposed to low levels of silica (i.e., < 0.02 mg/m^3), health monitoring should include spirometry and a medical examination every 4 years and a chest x-ray only when thereis a significant change identified on monitoring results.

Exit health assessments – is aimed to assess the possible detrimental effects on health of workers at the time they leave the company.

A spirometry test assesses how well you actually breathe.

You breathe into the mouthpiece of a spirometer to measure the volume of air that you can inhale and exhaleover a period of time.

This can be done at a doctor's surgery or at a respiratoryclinic at a local hospital.

Safe Work Australia provides guidance resources that may be useful for the General Practitioner in making a determination:

- About crystalline silica;
- Health monitoring before starting work in a crystalline silica process;
- During exposure to a crystalline silica process;
- At termination of work in a crystalline silica process;
- Potential health effects following exposure to crystalline silica;
- Crystalline silica - Health monitoring assessment and report.

Refer to:

Safe Work Australia – Health Monitoring Guide for Crystalline Silica

Health Surveillance Records:

The OHS Regulations require that:

- An employer must provide the worker with access to a copy of their health surveillance report;
- Reports of health monitoring to be kept confidential unless authorised by the worker or if theemployer is required by the regulations to provide WorkSafe with a copy of the report; and
- Records of health monitoring records are kept for 30 years post-employment unless another period isdeemed by WorkSafe.

Employers should check the accuracy of any health surveillance report received as members have reportedissues with incorrect dates, names and other information which may be detrimental to the company if notcorrected.

RCSD Generation and Carriage

Any process that disturbs construction materials can become a source of potential RCSD generation andcarriage, therefore exposure:

RCSD Generation

- Drilling and blasting rock;
- Crushing rock;
- Screening aggregates;
- Driving on haul roads;
- Stockpiles;
- De Dagging Agitators
- Loading or unloading dry concrete wash out waste
- Loading and unloading materials from stockpiles/trucks;
- Conveying materials and dropping materials from conveyors, into chutes, trucks or onto stockpiles;
- Repairing, or maintaining plant and equipment, e.g., screen changes, bag house filter repalcement;
- Buffing and grinding any backing surface for manganese placement;
- Sweeping or compressed air blowing of workshops, amenities, mobile equipment cabins;
- Heating materials so as to measure moisture contents;
- Grading materials using a sieve shaker;
- Drilling, cutting, or grinding masonry products.

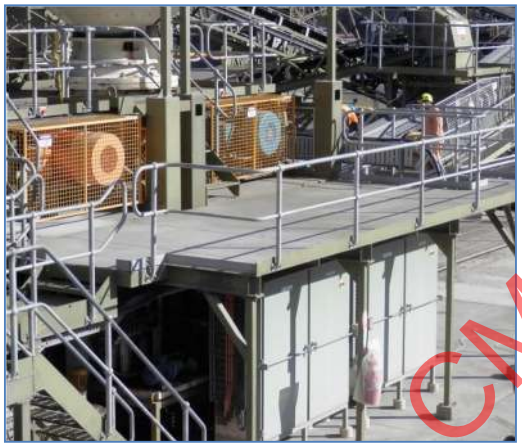
RCSD Carriage

- Wind
- Overall, shirt and trouser cuffs and pockets;
- Work boot treads;
- Tyre treads;
- Truck draw bars;
- Open bodied trucks.

RCSD although not necessarily visible may be suspended in confined areas or rooms that lack ventilation. Where practical, these areas should be wet down or well ventilated prior to entry.

RCSD monitoring has identified levels of RCSD higher than the WES in lunchrooms, plant rooms and mobile equipment cabins that has been carried there by operator clothing and footwear.

This standard of housekeeping has a significant influence on the level of potential RCSD Carriage.



A high standard of housekeeping significantly reduces the level of potential RCSD Carriage.

High Risk Crystalline Silica Work

The OHS Amendment (Crystalline Silica) Regulations 2021 require employers to identify any High Risk Crystalline Silica Work that that is undertaken in their workplaces.

High Risk Crystalline Silica Work is defined as work performed in connection with a Crystalline Silica Process that is reasonably likely to result in an airborne concentration of RCSD that exceeds half the exposure standard or is a risk to the health of a person at the workplace.

A Crystalline Silica Process consists of one or more of the following processes carried out at a workplace in the Construction Materials Industry:

- The use of a power tool or other form of mechanical plant to cut, grind, polish or crush material containing crystalline silica or carry out any other activity involving material containing crystalline silica that generates crystalline silica dust;
- A process that exposes a person to crystalline silica dust arising from the manufacture or handling of material that contains crystalline silica;
- The mechanical screening of crushed material containing crystalline silica;
- A quarrying process involving material containing crystalline silica.

To identify High Risk Crystalline Silica Work employers are required to.

- Conduct a risk assessment to identify whether the Crystalline Silica Process or combination of Crystalline Silica Processes is High Risk Crystalline silica work; or
- Identify the Crystalline Silica Process or combination of Crystalline Silica Processes as High Risk Crystalline Silica Work.

Where the rock source or raw materials being processed have a quartz content greater than 1% the CMPA recommends that the business operator identifies the Crystalline Silica Process or combination of Crystalline Silica Processes as High Risk Crystalline Silica Work and establishes and implements a Crystalline Silica Hazard Control Statement as required under regulation 319L.

This not only assists in compliance but ensures a comprehensive and targeted plan to control RCSD exposure.

RCSD Control

Hierarchy of Controls

It is a requirement under the OHS Regulations 2017, that controlling RCSD or any other hazards must be conducted:

- In alignment with the Hierarchy of Controls. This ensures the focus is on both a safe site and a safeworkforce;
- In consultation with those workers whose health and safety may be affected by theRCSD hazard, i.e. workers who undertake High Risk Crystalline Silica Work;
- To ensure exposure levels are below the WES as far as is reasonably practicable.

Reasonably practicable is defined as that regard must be had to the following matters in determining what is (or was at a particular time) reasonably practicable in relation to ensuring health and safety:

a) The likelihood of the hazard or risk concerned eventuating;

b) The degree of harm that would result if the hazard or risk eventuated;

c) What the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways ofeliminating or reducing the hazard or risk;

d) The availability and suitability of ways to eliminate or reduce the hazard or risk;

e) The cost of eliminating or reducing the hazard or risk.

The Hierarchy of Controls ensures we focus on both a safe site and a safe workforce and assists in deeming what is reasonably practicable.

Hierarchy of Controls

Elimination	Safe Site	Source rock cannot be eliminated or substituted
Substitution		
Isolation		Isolate workers from the RCSD source or carriage
Engineering		Contain, collect & or suppress the RCSD
Administration	Safe Workforce	Training, procedures, signage, and health surveillance
PPE		Respiratory protection, safety glasses, overalls, gloves

Fundamentals of the Control Process

Collect

Contain

Suppress

Crystalline Silica Hazard Control Statement

The OHS Amendment (Crystalline Silica) Regulations 2021 require workplaces that undertake High Risk Crystalline Silica Work to establish and work in compliance with a Crystalline Silica Hazard Control Statement.

In summary a Crystalline Silica Hazard Control Statement:

- States the type of rock or other material and its identified quartz content;
- Lists the hazards and risks associated with the High Risk Crystalline Silica Work;
- Describes the controls utilised to either eliminate or reduce the risk associated with the hazards as far as is reasonably practicable;
- Must be set out and expressed in a way that is readily accessible and comprehensible to the persons who use it.

Refer Attachment D) Crystalline Silica Hazard Control Statement (template)

If High Risk Crystalline Silica Work is not performed in accordance with the Crystalline Silica Hazard Control Statement the employer or self-employed person in control of the workplace must stop that work immediately or as soon as it is safe to do so; and not resume the work until the statement is complied with; or reviewed and, if necessary, revised in accordance with the below paragraph.

An employer or a self-employed person performing High Risk Crystalline Silica Work must review and, if necessary, revise the Crystalline Silica Hazard Control Statement:

- Whenever the work processes change;
- If there is an indication that risk controls are not controlling the risks adequately;
- If there is an indication that risk controls are not aligned to the order as listed in the Hierarchy of Controls;
- After any personal monitoring exposure exceeds the TWA adjusted action level of 0.02 mg/m3
- After any incident that occurs during and relevant to the High Risk Crystalline Silica Work.

When establishing the Crystalline Silica Hazard Control Statement the employer or self-employed person must consult with the workers who undertake High Risk Crystalline Silica Work.

The Crystalline Silica Hazard Control Statement shall be displayed in locations easily accessible to all workers who undertake High Risk Crystalline Silica Work. The statement shall be provided in languages other than English where required. Site managers will be responsible for communicating the statement to workers who lack literacy skills.

The CMPA recommends that workers who undertake High Risk Crystalline Silica Work shall be instructed in the application of the Crystalline Silica Hazard Control Statement and shall acknowledge in writing that they have been instructed in the application of the statement and that they are able and committed to comply with the statement. Workers shall re acknowledge the Crystalline Silica Hazard Control Statement upon revision of the statement. The CMPA recommends that the individual acknowledgement forms are held for 30 years post-employment such as health monitoring records are.

Refer Attachment E) Crystalline Silica Hazard Control Statement Acknowledgement Form

RCSD Control by Activity

Refer Attachment F) RCSD Controls Photo Gallery

Drilling, Blasting and Secondary Breaking:

- Provision of water for drillers dust suppression;
- Wet suppression or dry cyclone filtration systems for drilling;
- Wetting down of access roads and work area.

Load and Haul:

- Water cannon on shot rock prior to load and haul to crusher at regular intervals throughout the dayand well in advance of use;
- Regular application of water or dust suppressants or surface stabilisers on roads and other surfaces;
- Use of classed material on haul road as against lower quality materials with higher silt content;
- Dedicated water truck driver during dry season or as required;
- Use of water sprays in heavy traffic zones;
- Minimise and contain vehicle movements;
- Reduce onsite vehicle speeds, particularly in dry and windy conditions;
- Install bends on haul or sales access roads where practicable to reduce speed.

Crushing, Screening and Conveying Materials:

- Water sprays, foams or fog injectors used to suppress RCSD;
- Install interchangeable spray nozzle heads;
- Dust extraction systems used to collect and or contain dust at transfer points;
- Enclose RCSD generating sections of plant within purpose built enclosures, e.g., crushers, screens,transfer points;
- Adjust belt speed and size to reduce airflow and extend life of belt scrapers;
- Install impact beds (rather than rollers) under skirting systems to reduce belt sag;
- Isolate operators from generated RCSD as far as is practicable;
- Minimise the fall height of materials from conveyors to stockpile;
- Use Linatex socks to contain RCSD falling from conveyors;
- Installation of skirts around transfer point;
- Install belt cleaning sprays in opposite direction to travel;
- Restrict access to the work area to authorised personnel only;
- Consider zoning out (restricting access) to high dust areas with fencing;
- Climate controlled operator cabin with self-closing doors and air locked entry;

- CCTV systems to view required areas of operational plant;
- Rock breakers controls located in operator control cabin;
- Screens enclosed with covers;
- Minimise material spillage from conveyors, particularly at transfer points;
- Install scrapers or brushes on conveyor belts to avoid carry back;
- Install concrete hardstand under all conveyors, crushers and screens with full wash-down systemsincluding sediment pits;
- Ensure aggregates surfaces are damp, but not so wet as to cause blockages in screens and chutes.

Testing and Grading of Aggregates:

- Laboratories should be climate controlled and segregated from RCSD generation areas or carriage pathways;
- Installation of RCSD extraction units above benches where heating aggregates or within enclosedcupboard rooms where sieve shaking aggregates;

Stockpiling:

- Use water cannons, sprinklers or vehicular based sprays for small stockpiles;
- Where water is available consider washing all aggregates
- Ensure processed materials with fines are wet-mixed with optimal moisture content before beingplaced in stockpile;
- Establish tree wind rows on boundary of stockpile areas where practicable to reduce wind speed andRCSD carriage;
- Place large size aggregate stockpiles on boundary of stockpile areas where practicable to reduce windspeed and RCSD carriage;
- Place dust stockpiles in the centre of stockpile area at a lesser height than other stockpiles whererpracticable;
- Minimise stock on ground where able;
- Use environmentally appropriate dust containment agents on dust stockpiles where required;
- Keep stockpiles in walled bins below the height of the bin walls.

Mobile Equipment General Operations:

- Doors and windows of equipment are closed at all times;
- Cabins should be well sealed and regularly checked to ensure effectiveness;
- Air conditioning installed within equipment cabins filtered through high efficiency particulate air(HEPA) filters;
- Cabins regularly cleaned using HEPA filters vacuums or class M vacuums and wet wiping;
- Do not use compressed air to blow out cabins or filters;
- Removal of overalls and dirty boots prior to entering the cabin, wear slip on clean shoes/boots.

Traffic Areas:

- Establish sealed roads and carparks surrounding office and amenities areas where practicable;
- Use road sweeper in these areas and at site entrance;
- Install speed humps or bends on roads to reduce speed;
- Ensure traffic movements are reduced as far as is practicable;
- Restrict traffic movements to defined areas;
- Install wheel washes for vehicles leaving the site.

Loading and Unloading:

- Wet down areas where loading from and surrounding traffic routes;
- Ensure stockpiles being loaded including dry waste concrete from wash out pits are wet down prior to loading using water cart cannon orsprinklers;
- Enclose loadout bays where practicable;
- Truck drivers to remain in cabins whilst being loaded with windows closed;
- Install wheel washes for vehicles leaving operational areas of the site;
- Ensure incoming raw materials have been wet down prior to unloading;
- Prohibit opened bodied trucks and mandate use of tarpaulins.

General Housekeeping:

- Clean mobile equipment, workshops, buildings and other work areas using HEPA filter vacuums, Class M vacuums or wetcleaning methods (never use dry brush, brooms, rags, or compressed air);
- Install wet or dry fixed boot brushes at entrances to offices and amenities;
- Install dust booths external to change rooms and other amenities;
- Prohibit the wearing of work boots/overalls in offices and other amenities;
- Do not take any RCSD soiled clothing off site.

Maintenance:

- Maintenance should be undertaken wearing overalls that should be removed before entering mobileequipment cabins or offices and amenities;
- Utilise worker rotation to reduce exposure times;
- Wash down dusty areas well before performing maintenance work; taking into account you maycreate slip and fall hazards in doing so;
- Use dust extraction systems in restricted or confined areas including when de dagging agitators;
- Wear Full-face respirators or Powered Air Purifying Respirator (PAPR), i.e., air fed hoods where able.

General Administrative Controls:

- Training and education of workers;
- Housekeeping inspections and practices;
- Control of movement in and around plant;
- Personal and static dust monitoring;
- Health surveillance;
- Safe work procedures;
- Signage;
- Worker rotation to reduce exposure times;
- Audits;
- Reporting of dust related hazards and incidents;
- Monitoring community complaints;
- Observation of weather forecasts and scheduling work activities to suit;
- Ongoing visual monitoring.

Initially controls can be short or long term:

- Short-term controls are generally safe workforce controls e.g. the lower end of the Hierarchy of Controls. These controls may not be adequate orsustainable to lower the risk over a long-term duration;
- Short-term safe workforce controls may allow the safe continuation of work whilst long-term safe sitecontrols are being implemented;
- Long-term safe site controls e.g. the high end of the Hierarchy of Controls may take longer to resource and establish;
- Where short-term controls cannot reduce the risk to an acceptable level, the exposure of workers to theactivity or environment must cease until long-term controls are implemented and the risk has been reduced to an acceptable level.

RCSD extraction system used to collect and remove airborne RCSD rising in the heat.

Should be hard wired so as when heating pans turn on the extraction system immediately turns on.

Personal Protective Equipment

Overview:

Respiratory protective equipment (RPE) is commonly used to control exposure to RCSD.

In many workplace situations, higher order controls will not necessarily be adequate by themselves to reduceRCSD exposure to a level below the WES and therefore those controls may be supplemented by Respiratory Protective Equipment (RPE).

PPE is regarded as the last line of defence and must never be utilised without first considering the practicability and usage of higher order controls.

Respirator Standards:

Respirators and filters must meet the requirements of AS/NZS 1716 2012: Respiratory Protective Devicesthat categorises particulate filters into three classes being P1, P2 and P3:

- **CLASS (P1)** Intended for use against mechanically generated particulates, has a low to mediumabsorption capacity filter (Filters at least 80% of airborne particles)
- **CLASS (P2)** Intended for use against both mechanically and thermally generated particulates, Has amedium absorption capacity filter (Filters at least 94% of airborne particles)
- **CLASS (P3)** Intended for use against all particulates including highly toxic materials, Has a high absorption capacity filter. This can only be achieved in a full face respirator. (Filters at least 99.95% ofairborne particles)

The AS/NZS number, being 1716 and the filter class number being P2 should be marked on the respirator filter.Filters for powered air-purifying respirators are specially designed and marked with the prefix PAPR.

Disposable P2

Half Face Respirator

Full Face Respirator

Powered Air Purifying Respirator (PAPR)

Powered Air Purifying Respirator (PAPR)

A PAPR consists of a helmet/hood and face shield. A fan forces air through a replaceable filter in the back of the helmet/hood and around the face. Filtered clean air is pushed into the helmet, providing the wearer with fresh, cool air which enables easier breathing, and reduces heat and moisture build up including fogging.

A PAPR puts a positive pressure in the face piece so contaminated air cannot get in and clean air is blown out instead. Positive pressure works to keep airborne contaminants out of the helmet. With a loose seal around the neck of the helmet, and clean air being pushed in, there is more pressure inside the helmet than out. This means that particles and contaminants in the air will be pushed away from any potential entry points.

PAPRs:

- Can be used safely with beards and/or spectacles;
- Do not require face fit testing; and
- Are now manufactured as fully integrated meaning there are no trailing leads or hoses and no waist belt mounted filters that cause issues such as entanglement when working in restricted spaces such as screens or chutes

Protection Factor:

Protection factor is the level of protection required of the respirator for the dust concentration in the air.To calculate the required minimum protection factor, use the following formula.

$$\frac{\text{Observed Dust Concentration}}{\text{Workplace Exposure Standard}}$$

Example of Protection Factor Determination			
Concentration of RCSD mg/m³	**Workplace Exposure Standard mg/m³**	**Required Minimum Protection Factor**	**Minimum Respirator Group Type**
0.2	0.05	4	A
0.6	0.05	12	B
3.0	0.05	60	C
6.0	0.05		D

Protection Factors for RCSD		
Protection Factor	**Suitable respirator type for mechanically generated silica dusts**	**Group**
Up to 10	Any of P1, P2 or P3 filters with half face piece, disposable or non-disposable	**A**
Up to 50	P2 filter in full face piece PAPR with – P2 filter, any head covering PAPR with P3, any head covering Half face piece respirator with positive pressure demand or continuous flow airline	**B**
Up to 100	P3 filter in full face piece Full face piece air hose type.	**C**
100 plus	PAPR with P3 filter, head covering and blouse Head covering airline respirator –continuous flow Protection factor may not be achieved with facial hair Full face piece – continuous flow or positive pressure demand air supply	**D**

Selection of Respiratory Protection Equipment:

Respiratory Protective Equipment (RPE) requirements are to have at least a P2 filter and be fit tested for eachperson to ensure it fits correctly.

RPE that requires a facial seal, such as half-face respirators, should not be used by people with beards or evenfacial stubble. Where facial hair interferes with the fit of the RPE, a powered air purifying respirator (PAPR) that does not rely on a facial seal needs could be used. Potential users should refer to supplier for further information.

RPE needs to be selected, used and maintained in accordance with AS/NZS 1715 – Selection, use and maintenance of respiratory protective equipment. Employers must provide workers with information,instruction and training in RPE use and maintenance**.**

Refer to Protection Factor Table for more detail.

Points to consider when selecting which type of respirator to use:

- What other PPE you will need to wear, such as earmuffs, hard hat and goggles, and how these willaffect the respirator fit;
- The task to be carried out, the workload, the possibility of heat stress, entanglement and the need formobility;
- Any facial hair or other facial features that may influence the respirator fit;
- The airborne concentration of dust in the area you are working.

Fit, Test & Care of Respiratory Protection Equipment:

Disposable Respirators:

- Adjust strap and nose clip to suit;
- Completely cover the mask with both hands and inhale sharply. The respirator should sink onto yourface and should be tested prior to each use;
- If you feel a stream of air around the edges (particularly at the bridge of the nose) then you have apoor seal;
- Adjust strap and nose clip and re-test;
- Used respirators must be disposed of into a bin.

Non-disposable Respirators:

Cover the inlets of the filters and inhale gently so that the face piece collapses slightly;

- Hold your breath for about 10 seconds, if the face piece stays slightly collapsed then you have a goodseal;
- Cover outlet valve and attempt to exhale;
- The respirator should be tested prior to each use;
- After use, these masks need to be washed in warm water and detergent/disinfectant, rinsed, andstored in plastic bag/box in a safety equipment cabinet.

Note:

All respirator filters will eventually become ineffective and must be replaced. Dust filters may actually increasein efficiency (as the filter blocks up) but their resistance to air flow also increases gradually with use, making them harder to breathe through.

Reasons for poor fitting respirators

- Beards, moustaches, sideburns, 1-7 day growth;
- Poor or damaged seal;
- Incorrectly fitted/wrong size;
- Strapping adjustment;
- Other PPE intruding;
- Sweaty, wet, dirty, or dusty.

Wrap Around Safety Glasses and Sealed Goggles

Safety glasses or sealed goggles should be worn to protect against RCSD irritating, scratching or damaging the eye:

- Wrap around safety glasses should be worn at all times while in the vicinity of the processing plant and on windy days;
- Sealed googles should be worn when working in areas where airborne dust is visible and in enclosed areas such as screens or chutes when undertaking maintenance;
- Best practice is to mandate use of wrap around safety glasses across whole of site excluding administration and amenities areas and mandating the use of sealed goggles for specific maintenance activities.

Clothing

Overalls should be worn whilst working in dusty environments and then removed so RCSD is not carried into the operator cabin, lunchroom, office, car or home:

- Remove overalls while you are still wearing a respirator;
- Use dust booth where available;
- Do not shake out dusty overalls;
- Do not take dusty overalls home;
- Arrange contract supply and cleaning;

Gloves

- Riggers gloves worn when carrying out maintenance tasks;
- Rubber gloves worn whenever handling cement dust or wet concrete.

Work Boots & Shoes

- Work boots worn outside should not be worn in mobile equipment, internal workstations and officeor amenities;
- Slip on shoes should be provided for this purpose.

Signage Requirements

Wherever PPE is to be worn the relevant signpost should be installed.

Induction and Safe Work Practices

Induction

Site WHS Inductions should refer to RCSD and the associated controls such as:

- How to report RCDS hazards;
- Why you are required to wear respiratory protection at work;
- The purpose and process of respirator fitting;
- How to use and care for your respiratory protection provided; and
- What other PPE is provided for protection against RCSD in the workplace.

Safe Work Practices

Safe Work Procedures (SWPs) and Safe Work Method Statements should list the RCSD controls specific to the task inclusive of PPE requirements.

Personal Protective Equipment (PPE) Requirements							
							
YES	YES	AR	AR	AR	AR	YES	YES

A pictogram in a SWP/SWMS that directs PPE as (YES) being Mandatory and (AS) being as Required

Workplace Hazard Inspections

Workplace Hazard Inspections should be undertaken on a scheduled and routine basis and should be inclusive of the inspection of all physical controls to reduce dust exposure.

RCSD Awareness and Control Training

Workers potentially exposed to RCSD hazards shall be provided with training that covers the following subjects:

- The sources of RCSD generation in the workplace;
- The hazards and health effects associated with working with RCSD;
- The health surveillance regime;
- How RCSD exposures are monitored and reports are read;
- How to control RCSD exposure following the hierarchy of controls;
- Why you are required to wear respiratory protection at work;
- The purpose and process of respirator fitting;
- How to use and care for your respiratory protection provided;
- What other PPE is provided for protection against RCSD in your workplace.

An assessment should be conducted on completion of the training and records of that assessment and trainingcontent maintained within the worker's employment file.

Training should be conducted on a routine basis, preferably annually prior to the dry season where potentialRCSD exposure may be more prevalent.

Review of RCSD Controls

On completion of the implementation of controls it is imperative that they are reviewed in consultation with the relevant workers to ensure that the controls are effective by:

- Providing the protection that they are intended to;
- Being practical to use, e.g., PPE fit and comfort;
- Not causing any operational issue, e.g., material blockages, out of specification materials.

Scheduled routine workplace inspections should include the monitoring of controls to ensure they remaineffective and are being maintained in the appropriate manner.

Re-monitoring of potential exposures should be conducted to verify the suitability of the controls in reducingRCSD exposure levels to well below the action limit/trigger value.

RCSD Control Self-Assessment

To ensure the effectiveness of your RCSD control program and compliance with current regulations the CMPA recommends that you undertake a self-assessment of the actions on a routine and or as required basis.

The self-assessment is based on a risk management process to ensure you have implemented all required actions.

Overview of RCSD Control Self-Assessment Content			
Identification Actions	**Assessment Actions**	**Control Actions**	**Review Actions**
Rock Source *Quart Content* *High Risk Crystalline Silica Work processes*	*RCSD Monitoring* *Health Surveillance*	*Safety Data Sheets* *Hierarchy of Controls* *Crystalline Silica Hazard Control Statement* *Inductions* *Training & Fit Tests (PPE)*	*Control Reviews* *Workplace Inspections* *Crystalline Silica Hazard Control Statement Review*

Refer Attachment G) RCSD Control Self-Assessment Checklist