

Workplace Health and Safety Queensland

Information guide

Silica—Identifying and managing crystalline silica dust exposure

Background

Dusts containing respirable silica represent a longstanding health hazard in Queensland's workplaces. This hazard can be found in construction, foundries, tunnelling, brick, tile and concrete product manufacturing, monumental masonry, some abrasive blasting operations and metal polishing. Silica is also a widespread hazard in all mining.

No single source of information has been previously available that combines health risk, regulatory requirements, risk assessment advice, exposure standard data, control information and training requirements. There are up to 15 different sources that the WHSO or health and safety specialist has to refer, to fully understand obligations and control the risks from respirable crystalline silica. Condensed information is now available in a single document *Occupational Disease Strategy 2007–2010 Silica* found on Workplace Health and Safety Queensland's website at www.worksafe.qld.gov.au. Additional information about the risks to health can be found in the WHSQ fact sheet *Silica and the lung*.

This information guide *Silica - Identifying and managing crystalline silica dust exposure* provides brief guidance on the legislative requirements for identifying and managing respirable crystalline silica dust exposure in workplaces.

When is silica a regulated hazardous substance?

In many instances, respirable crystalline silica exposures will be subject to the requirements as set in the *Workplace Health and Safety Regulation 2008* Part 16. In other instances, such as tunnelling, brick chasing or concrete grinding, where no material safety data sheet accompanies the source of the crystalline silica, processes are dictated by the requirements of the *Workplace Health and Safety*



Act 1995. However, workplaces choosing to follow the Regulation will fully comply with health and safety obligations. Best practice control of silica incorporates the use of the new National Exposure Standard for respirable crystalline silica now found in SafeWork Australia's Hazardous Substances Information System.

What are risks from silica?

Health risks from respirable crystalline silica exposure include chronic obstructive pulmonary disease (including chronic bronchitis and emphysema), silicosis, lung cancer, and renal disease. Lung defence mechanisms against the very fine dust that penetrates to the alveolar oxygen exchange part of the lung can be overwhelmed by silica particles, which can be toxic to macrophages. These diseases have a long latency, usually appearing decades after exposure commences. Although frank cases of silicosis have decreased substantially over the last three to four decades, increases in mechanisation have resulted in potentially very high exposures in some workplaces.



What does the legislation say about working with crystalline silica?

Crystalline silica has been the subject of regulation in Queensland's workplaces since 1995. Details of general requirements can be found in the *Workplace Health and Safety Regulation 2008* Part 16 dealing with hazardous substances. In particular, workplaces supplied with products comprising silica (such as sand) will be subject to the Regulation.

The process recommended below has been determined to be appropriate for identifying and managing respirable crystalline silica. The risk from respirable crystalline silica is present in the form of dust exposure arising usually through some processing operation.

There are seven basic steps in the process to meet the requirements of the Regulation. Induction and training, together with record keeping should form an integral part of these steps.

Step 1. Identifying crystalline silica through the material safety data sheet

When crystalline silica containing materials are supplied and brought into workplaces, they need to have accompanying documentation in the form of material safety data sheets (MSDS). These will identify that silica is a hazardous substance and must state, as a minimum:

- the substance's product name
- information about the:
 - chemical and physical properties
 - health hazards
 - safe use
 - manufacturer's or importer's name, address and contact (in Australia).

Step 2. Assessing the risk

Assessing the risk from operations involving crystalline silica commences with the product's material safety data sheet. The material safety data sheet will provide crucial information about the

risks to health from respirable crystalline silica, the National Exposure Standard and a range of controls appropriate for respirable crystalline silica. A thorough examination of all work processes involving crystalline silica must then be made to determine if workers are exposed to dust containing respirable crystalline silica. If workers are exposed, an assessment has to be made on their level of exposure.

If you can reliably make this assessment of exposure, it should permit you to determine the **significance of risk**. If you cannot (and remembering that respirable dust is not visible to the naked eye), you may need to undertake Step 3 as follows below. A risk assessment record containing details of the risks to health, significance of risk, best options for control, and any needs for monitoring or health surveillance must also be made.

Step 3. Monitoring

Monitoring involves sampling the air that a worker breathes to compare the worker's exposure with the exposure standard permitted by the Regulation (see below).

Measurement will best determine the level of control required and will point the way to the most appropriate control strategy.

Monitoring for respirable crystalline silica usually requires sampling the atmosphere where the worker is exposed to the dust by using a portable pump and a special sampling device (a vertical cyclone elutriator), which is attached to the worker for most of a working shift. Samples are then analysed by a laboratory for their respirable dust concentration and the respirable crystalline silica content. Because of environmental and workplace task variability, repeat sampling may be needed to determine the true likely exposure and the likelihood of compliance with the regulatory exposure standard. Regular sampling should be conducted every 12 to 18 months or more often if there are process changes indicating increased **significance of risk**.



Most monitoring is conducted by consultant laboratories, private consultants or occasionally by government Workplace Health and Safety Queensland inspectors.

The exposure standard for respirable crystalline silica

The National Occupational Health and Safety Commission in 2004 declared a National Exposure Standard (ES) for crystalline silica of 0.1 mg/m^3 pertaining to dusts containing quartz, cristobalite or tridymite, measured as respirable dust. The sampling protocol to be used is that contained in Australian Standard 2985 – 2004 *Workplace Atmospheres- Method for sampling and gravimetric determination of respirable dust*. Analytical techniques commonly used for measuring quartz are either infrared spectrometry or X-ray diffractometry of the dust deposited on the collecting filter.

Step 4. Controlling the risk

Section 205 of the *Workplace Health and Safety Regulation* establishes the performance standard that the relevant person must meet for workers exposed to a hazardous substance, in this case respirable crystalline silica. This performance standard is:

- Prevent exposure.

- If prevention (of exposure) is not possible, then the exposure must be reduced as far as is reasonably practicable, **but in any case, the exposure must not be more than the relevant exposure standard** for the relevant period.

Further, the Regulation specifically requires that the relevant person should be using methods other than the use of personal protective equipment to prevent or reduce the exposure. What this implies is that there is a hierarchy of control that the relevant person must consider before reaching the conclusion that personal protective equipment in the form of respirators is the most appropriate way to control the exposure to the silica.

The *Hazardous Substances Code of Practice* details this hierarchy of control. The following table discusses some of the different controls and their utility for workplaces with respirable crystalline silica exposure.

Different controls and utility against respirable crystalline silica include:

Elimination	Often difficult; sand is integral part of much construction; unavoidable in tunnelling and excavation.
Substitution	Suitable for abrasive blasting agents; aluminium oxide polishing powders in place of silica.
Engineering controls	Containment – enclosed abrasive blasting chambers. Ventilation – local exhaust ventilation (LEV) prevents contamination of workplace air; use on pouring, grinding, moulding, fettling, bagging, mixing, crushing, drilling, chasing, polishing, blasting. LEV available as either enclosing or external hoods. Suppression – use of water sprays in tile and brick cutting.
Administrative controls	Housekeeping, signage, restricting time of exposure, rotation of staff away from dusty areas.
Respiratory protective equipment	Applicable for short term applications; suitable for all emergency applications; useful when higher order controls cannot fully control the risk. Available in range from simple P1 or P2 disposable half-face respirator to Powered Air Purifying Respirator (PAPR) and air supplied positive pressure demand respirator. Minimum required protection factors may need to be determined for correct respirator selection. See AS/NZS 1715 or WHSQ's silica documentation for further assistance.

For many workplaces with a respirable crystalline silica issue, such as concrete construction and foundries, elimination and even substitution of silica containing sands is an impractical control strategy. In addition, preventing exposure is likewise an impractical control aim, as some crystalline silica will occur wherever sands are encountered.

Therefore, the secondary goal must be met, that of reducing exposure as far as practicable and at least to below the current exposure standard.

Respirators for particles are graded in terms of their performance in removing particles from air to be inhaled. The *Australian New Zealand Standard 1715 Selection Use and Maintenance of Respiratory Protective Equipment (2009)* contains the full guidance on selecting respirators for the workplace.

Step 5. Health surveillance

Health surveillance for crystalline silica is applicable under Part 16, Section 207 of the Regulation. Although crystalline silica is listed in Schedule 8 of the Regulation, surveillance is required only if a number of conditions are met. The principal one is that the “*degree of risk to the health of the relevant person or worker is significant*”. As a guide, exposure of unprotected workers above the ES is considered a significant risk. Exposures >0.5 the ES are at least in need of a review.

The relevant person must arrange for health surveillance to be done by a [Designated Doctor](#). Schedule 8 of the Regulation lists the requirements which the designated doctor will conduct in the health surveillance. This may include chest X-ray, lung function testing, questionnaire and taking an exposure history. Designated Doctors can be identified through the www.worksafe.qld.gov.au website.

Step 6. Keeping records

Record keeping is important for workers exposed to this respirable crystalline silica hazard where diseases may have long latency (e.g. two or three decades). However, full records need to be kept for a period of 30 years only if the risk has been found to be significant. These records include:

- the risk assessment record
- a monitoring result
- a health surveillance report.

Where the risk is not significant, only the risk assessment record needs to be kept and for a period of five years.

Step 7. Induction and training

Induction and training about silica hazards must be conducted and should contain information about:

- the health risks from inhaling respirable crystalline silica
- where to gain information about respirable crystalline silica (e.g. material safety data sheet or labels)
- how the work operations will expose workers
- how the control processes are intended to operate
- any use of respiratory protection and worker respirator fit and check processes
- what the risk assessment shows
- what air monitoring results indicate
- health surveillance and a health surveillance report
- accessing all appropriate records on their work with and exposure to respirable crystalline silica.

The training given has to take into account the level of risk posed by the respirable crystalline silica exposure. Keep a record of who was trained, who conducted the training, when it was given, and the topics covered.

For more information

Visit www.worksafe.qld.gov.au or call the Workplace Health and Safety Info Line on 1300 369 915.

Visit the website to download:

- *Silica and the lung*—fact sheet
- *Occupational Disease Strategy 2007–2010—Silica*
- *Workplace Health and Safety Act 1995*
- *Workplace Health and Safety Queensland Regulation 2008*
- *Hazardous Substances Code of Practice 2003*
- *Foundry Code of Practice 2004*
- *Abrasive Blasting Code of Practice 2004*
- *Tunnelling Code of Practice 2007*
- *Silica – Managing silica in the workplace – Occupational Disease Strategy 2007 – 2010. Workplace Health and Safety Queensland.*

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