



Mines Safety Bulletin No. 163

Subject: Reducing exposure to respirable crystalline silica (quartz)

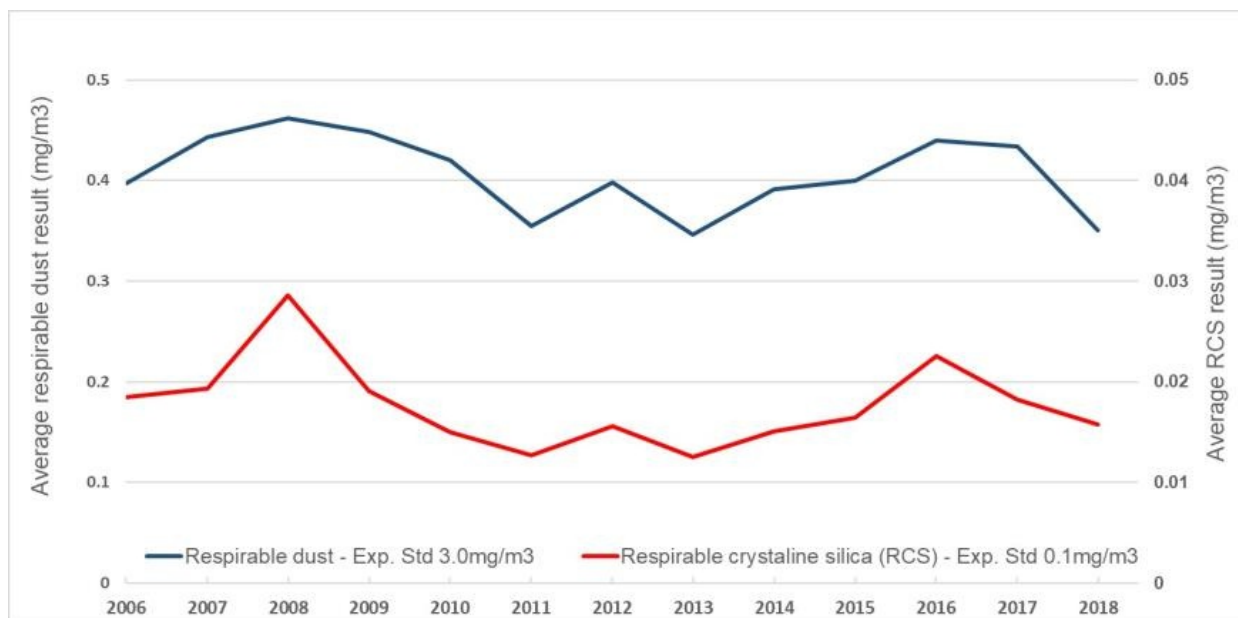
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Background

Chronic exposure to high concentrations of respirable crystalline silica (RCS) can cause silicosis, which is a progressive fibrotic disease of the lungs that leads to chronic shortness of breath and scarring of the lung tissue. In 1997, the International Agency for Research on Cancer (IARC) determined that crystalline silica inhaled in the form of quartz or cristobalite from work-related sources is carcinogenic to humans (Group 1).

The main forms of crystalline silica are quartz, cristobalite and tridymite. Quartz is most common and occurs in higher concentrations in granite, shale and sandstones and is present in most metal, non-metal and coal mines.

Figure 1 shows that while average respirable dust and RCS exposure levels in the WA mining industry have steadied over the last 12 years, exceedances in both dust and RCS continue to occur periodically in all commodities during most activities. Approximately 3 % of these exposure measurements exceeded current exposure standards annually over the past five years.



Average respirable dust and crystalline silica exposures (DMIRS, 2006-2017)

Therefore reducing dust generation and distribution across the site during exploration, mining and processing should remain a high priority at all mine sites. Importantly, higher rates of RCS exceedances occur at sites that crush and/or handle ores with higher quartz content (for example, construction sands, silica-sand quarries and base metal operations).

As the risk of developing silicosis and lung cancer increases for workers with higher exposures, focussing on controlling dust and RCS exposure is an important part of an effective disease prevention strategy.

Summary of hazard

Crystalline silica occurs in fine respirable dusts created by crushing and handling ores. Also commonly referred to as silica, RCS is comprised of crystalline forms of silicon dioxide that are abundant in most soils and rocks. Amorphous and fumed forms of silica are less harmful than RCS.

Very fine respirable dusts characteristically have low density and diameter which facilitates easy transport to the alveolar regions of the lungs when inhaled.

Contributory factors

- Mining, crushing and handling ores with high quartz content.
- Ineffective use of dust control measures to minimise worker exposure directly or from fugitive dust emissions from exploration and mining activities, including haulage roads.
- Over-reliance on personal protective equipment.
- Absence of sufficient information and training of the risks associated with inhalation of dusts, including how and when to use appropriate respiratory protective equipment.

Actions required

The following actions are recommended to reduce exposure of workers to respirable crystalline silica.

- Control generation, release and distribution of dust at each stage of the mining operation using appropriate dust control strategies that include:
 - extraction ventilation at the source of the dust generation
 - positive-pressure dilution ventilation for all fixed and mobile plant cabins
 - water sprays to suppress dust released from stockpiles and haul roads
 - enclosures to separate workers from dust sources (e.g. enclose workshops from prevailing winds)
 - train workers who are at risk of exposure to select, maintain and use adequately fitted, task-appropriate respiratory protective equipment.
- Consult with site ventilation officers and review inspection records and exposure monitoring results. Identify high risk locations and activities for targeted design and implementation of control measures to minimise release of RCS to the atmosphere and reduce exposures.
- In accordance with *Mines Safety and Inspection Act* (section 75) and Regulations (Part 3. Division 4 – Health surveillance), ensure that appropriate health surveillance is undertaken for at risk workers.
- Notify the Mines Safety Directorate via SRS using the approved form, if an employee develops an occupational disease.

Further information

- Department of Mines, Industry Regulation and Safety
Health and hygiene management – understanding your responsibilities and regulatory requirements – information sheet
www.dmp.wa.gov.au/Documents/Safety/MSH-IS_HHRegulatoryRequirements.pdf
Guidance about risk-based approach to health surveillance
www.dmp.wa.gov.au/Safety/Guidance-about-risk-based-6833.aspx
Risk-based health surveillance and biological monitoring – guideline
www.dmp.wa.gov.au/Documents/Safety/MSH_G_RiskBasedHealthSurveillanceAndBiologicalM
- Safe Work Australia
Crystalline silica health monitoring – guide
www.safeworkaustralia.gov.au/system/files/documents/1702/crystalline_silica.pdf
www.safeworkaustralia.gov.au/silica
- Australian Standard AS/NZS 1715:2009 – Selection, use and maintenance of respiratory protective equipment

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