

# Crystalline Silica



# Legislative Requirements

The following requirements have been identified as applicable:

## Model WHS Regulations (Safe Work Australia)

- Regulation 49: Employers must ensure workers are not exposed to airborne contaminants above the Workplace Exposure Standard (WES).
- Workplace Exposure Standards for Airborne Contaminants, which include a limit of  $0.05 \text{ mg/m}^3$  (8-hour TWA) for respirable crystalline silica (quartz).

## NSW WHS Regulations 2017

- Clause 50
- PCBUs to monitor airborne contaminant levels if there's uncertainty about exposure levels or if there's a risk that the exposure standard may be exceeded.

Code of Practice Managing the Risks of Respirable Crystalline Silica from Engineered Stone in the Workplace. February 2022

Silica Dust Strategy SafeWork NSW

# NSW WHS Regulations 2017

## Chapter 8A – Crystalline Silica

This chapter outlines definitions, duties, and control measures for managing risks associated with crystalline silica substances (CSS).  
[legislation.nsw.gov.au](http://legislation.nsw.gov.au)

- **Clause 529A:** Defines "processing" in relation to CSS, including activities like crushing, cutting, grinding, sanding, and drilling. [legislation.nsw.gov.au](http://legislation.nsw.gov.au)
- **Clause 529B:** Specifies what constitutes "controlled" processing of CSS. [legislation.nsw.gov.au](http://legislation.nsw.gov.au)
- **Clause 529CB:** Mandates the preparation of a **Silica Risk Control Plan** for high-risk processing activities. [legislation.nsw.gov.au](http://legislation.nsw.gov.au)
- **Clause 529CC:** Requires implementation of control measures to minimize exposure to RCS.
- **Clause 529CD:** Outlines the need for health monitoring of workers exposed to RCS.
- **Clause 529CE:** Details the record-keeping requirements related to RCS exposure and health monitoring.

**Crystalline silica is a natural mineral found mostly as quartz in sand and sandstone which are used in building products.**

**Workers will also come across silica when excavating or tunnelling through sandstone.**

Typical crystalline silica levels in different materials are:

- sand and sandstone: 70-100%
- manufactured stone: 93% or higher
- granite: 20-45% (typically 30%)
- concrete and mortar: 25-70%
- calcium-silicate bricks: 50-55%
- slate: 20-40%
- brick: up to 30%
- fibre cement sheets: 10-30%
- demolition dust: 3-4%
- marble: 2%
- limestone: 2%

## Sources of Exposure

1. Construction (cutting, grinding, drilling)
2. Mining, foundries manufacturing
3. Natural vs. artificial stone (engineered stone hazards)





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When workers cut, grind, drill or crush materials that contain crystalline silica, very small dust particles are created (respirable crystalline silica).



# Tasks with Airborne Exposure

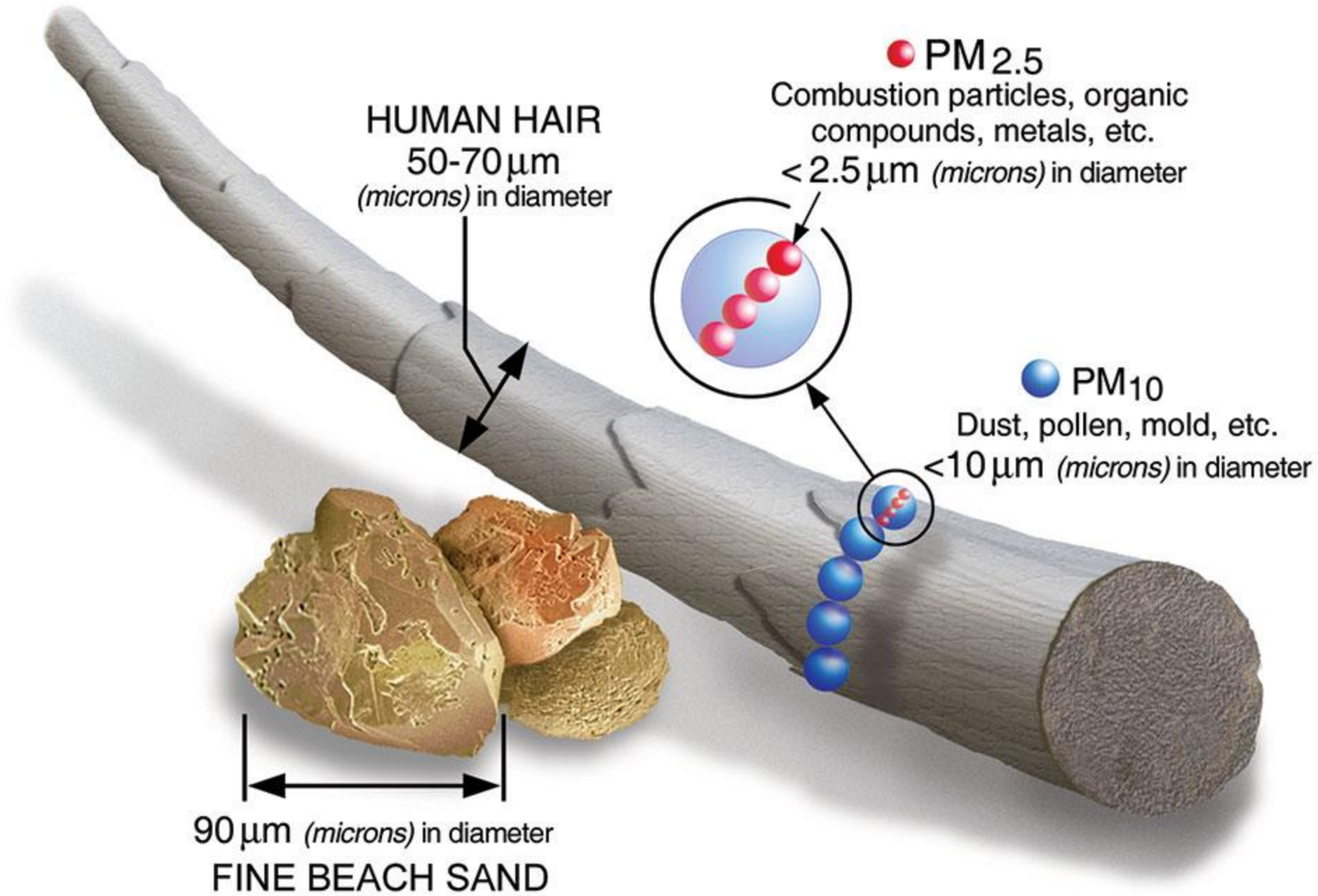
Industries	Job Tasks
Manufacturing	Abrasive blasting, glass making, making soaps & detergents
Ceramics	Manufacturing clay, pottery
Construction	Sandblasting, rock drilling, masonry work, jack hammering, tunneling
Foundry work	Grinding, molding, shaking, core room
Mining	Cutting stone, drilling through rock
Railroad	Setting/laying track
Stone cutting	Sawing, abrasive blasting, chipping, grinding



# Crystalline Silica



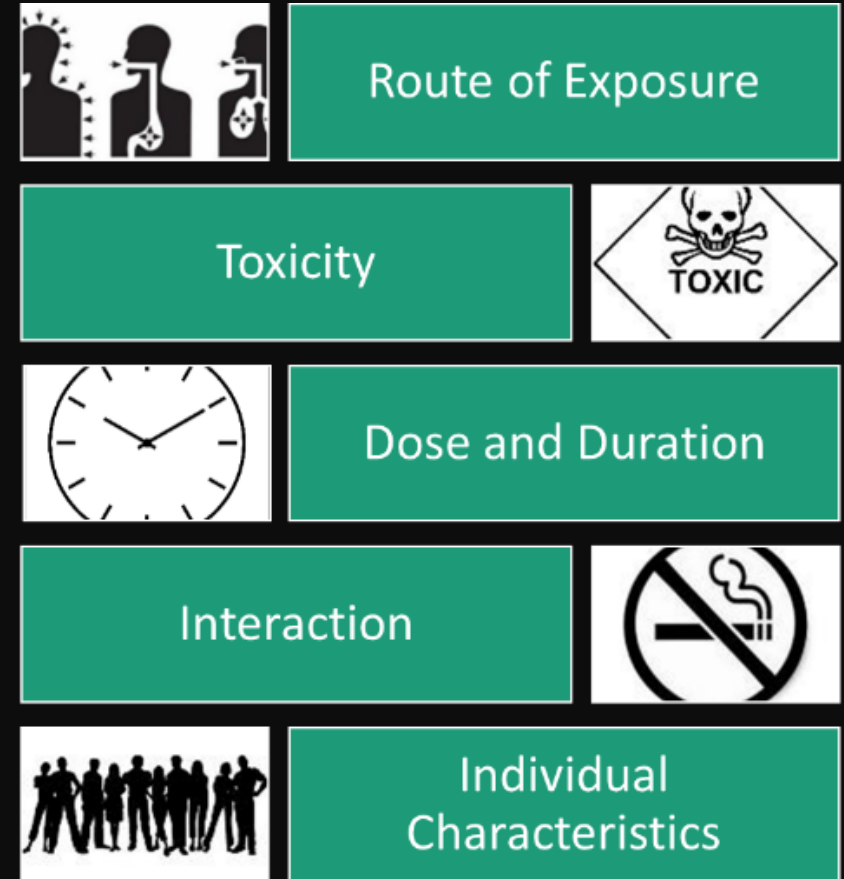
# Respirable Crystalline Silica



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**Is exposure to crystalline silica hazardous? It depends on various factors:**

- Route of exposure
- Toxicity
- Dose and duration
- Interaction
- Individual characteristics





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**Very fine particles of crystalline silica dust present a hazard when inhaled into the lungs. Airborne dust is most likely to occur when materials or products containing silica are cut, sanded, drilled or any other action (task) that creates fine dust.**

**Exposure to RCS dust can have serious health effects depending how much dust a worker breathes in and for how long. These health effects can include:**

- **silicosis – a scarring of the lung which can result in a severe shortness of breath and is not reversible. Severe cases can result in complications leading to death.**
- **lung cancer**
- **kidney disease.**



# Symptoms of Silicosis

Early (Often Asymptomatic)

Mild shortness of breath with exertion



Occasional dry cough




Fatigue or general tiredness

# Symptoms of Silicosis

## Progressive Symptoms

As the disease advances, symptoms become more pronounced:



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graph TD; A[As the disease advances, symptoms become more pronounced:] --> B[Persistent and Worsening Cough]; B --> C[Shortness of Breath during Routine Activities or Even at Rest]; C --> D[Fatigue and Weakness & Chest Pain or Tightness]; D --> E[Loss of Appetite & Weight Loss];
```

Persistent and Worsening Cough

Shortness of Breath during Routine Activities or Even at Rest

Fatigue and Weakness & Chest Pain or Tightness

Loss of Appetite & Weight Loss

# Symptoms of Silicosis

## Severe or Advanced Stage

Severe Shortness of Breath

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graph TD; A[Severe Shortness of Breath] --> B[Respiratory Failure]; B --> C[Blue Lips or Fingertips (Cyanosis) from Lack of Oxygen]; C --> D[Swelling in the Legs from Heart Strain (Late-Stage Complication)];
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Respiratory Failure

Blue Lips or Fingertips (Cyanosis) from Lack of Oxygen

Swelling in the Legs from Heart Strain (Late-Stage Complication)



# Controlling Exposure to Silica

# How to Protect Yourself and Workers

Any worker involved in high-risk silica work activities or workers who may be at risk of exposure to RCS because of that work activity must complete a crystalline silica training course

Provide all workers with information and instruction on how to work safely with silica products in the workplace

Eliminate tasks that generate dust where possible

Apply water suppression systems to reduce dust generation

Use local exhaust ventilation systems to capture and remove dust at the source

Use dust capture systems on portable tools

Instruct workers in the correct use, selection, fit, and maintenance of respiratory protective equipment.

Avoid using compressed air to remove or clean settled dust

Avoid dry sweeping where possible

Follow instructions and controls outlined in safety data sheets and product labels.

# Processing of Crystalline Silica

Processing of Crystalline Silica is considered controlled if:

1. Control measures are applied to eliminate or minimize risks arising from the processing, as far as is reasonably practicable.
2. At least one of the following measures is employed during processing:
  - a) Isolation: Isolating the person from dust exposure.
  - b) Enclosed Operator Cabin: Utilizing a fully enclosed operator cabin equipped with a high-efficiency air filtration.
  - c) Wet Dust Suppression: Applying an effective wet dust suppression method.
  - d) On-Tool Extraction: Using an effective on-tool extraction system.
  - e) Exhaust Ventilation: Implementing an effective local exhaust ventilation system.

# Planning & Preparation

- Conduct site-specific risk assessment for dust generation.
- Identify presence of hazardous dusts (e.g., silica, asbestos).
- Plan work during favourable weather (low wind, damp conditions).
- Establish exclusion zones where dust levels are high.





# Respiratory Protection

Employers must:

- Provide respirators if needed
- Follow the respiratory protection standard



# Types of Respirators

**Disposable Respirators (Filtering Facepieces)**

**Examples:** P2 or N95 masks

**Use case:** Low exposure settings; short tasks or backup when engineering controls are effective

**Limitations:** Not reusable; fit testing is essential; can be ineffective if poorly fitted



# Types of Respirators

**Half-Face Reusable Respirators**

**With P2 or P3 filters (particulate filters)**

**Better fit and seal than disposable masks**

**Suitable for moderate exposure or longer tasks**

**Must be cleaned and maintained regularly**



# Types of Respirators

**Full-Face Reusable Respirators**

Same filters (P2 or P3), but provide additional protection for eyes and better face seal

Suitable for higher exposure levels

Provide protection when dust may irritate the eyes



# Types of Respirators

## Powered Air-Purifying Respirators (PAPR)

With P2/P3 filters and either half-face or full-face hoods/helmets

Use a fan to draw air through filters and deliver it to the user

Reduce breathing resistance and increase comfort

Excellent for long-duration tasks or hot/humid conditions. Often used when test fitting is problematic (e.g., with facial hair)



# Types of Respirators

**Supplied Air Respirators**

**Deliver clean air from a remote source  
(airline respirators)**

**Used in high-risk or confined space work  
environments**

**Appropriate when silica dust levels are  
extremely high or other protection is  
insufficient**

# Housekeeping

When cleaning silica dust, avoid:

- Dry sweeping/brushing
- Compressed air without a ventilation system to capture the dust



# Exposure Control Plan

**Employers must:**

- **Prepare and implement plan addressing:**
  - **Exposure sources**
  - **Controls**
  - **Housekeeping**
  - **Restricting access**
- **Review plan yearly**
- **Make it available**





# Air Monitoring

**Sampling:** Air samples are collected from the worker's breathing zone using small sampling devices connected to air sampling pumps. The following methods may be employed:

- **Personal Sampling:** Using devices worn by workers to measure exposure in their breathing zone during normal work activities.
- **Area Sampling:** Placing monitors in specific locations to assess ambient air quality.
- **Data Analysis:** Interpreting results to determine exposure levels and the effectiveness of control measures.

**Analysis:** The collected samples are analysed in a laboratory to determine the weight of respirable dust and the presence of quartz.

**Interpretation:** The results are compared to the workplace exposure standard (WES), which is currently 0.05 mg/m<sup>3</sup> (eight-hour time weighted average) for respirable crystalline silica.

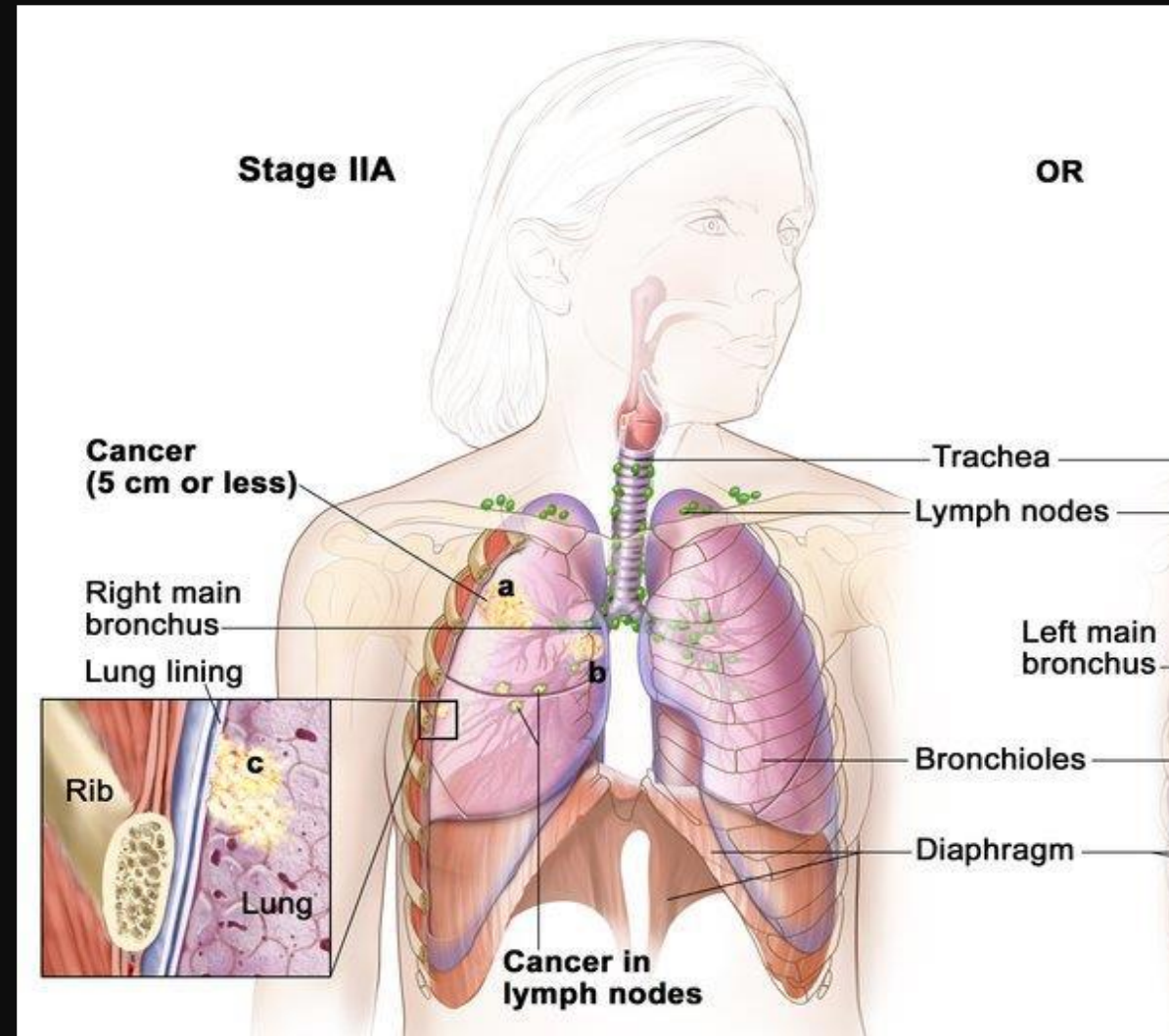
**Action:** If the exposure standard is exceeded or there's uncertainty, further investigation and control measures may be required.

# Health Monitoring

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## Monitoring Required

- Demographic, medical and occupational history.
  - Records of worker's personal exposure.
  - Standardised respiratory questionnaire.
  - Physical examination with emphasis on the respiratory system.
  - Standardised respiratory function tests unless another form of health monitoring is recommended by the registered medical practitioner.
  - Full chest X Ray (Crystalline Silica)
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# Record Keeping

Employers must:

- Keep medical and exposure records
- Make them available
- Retain for 30 Years

