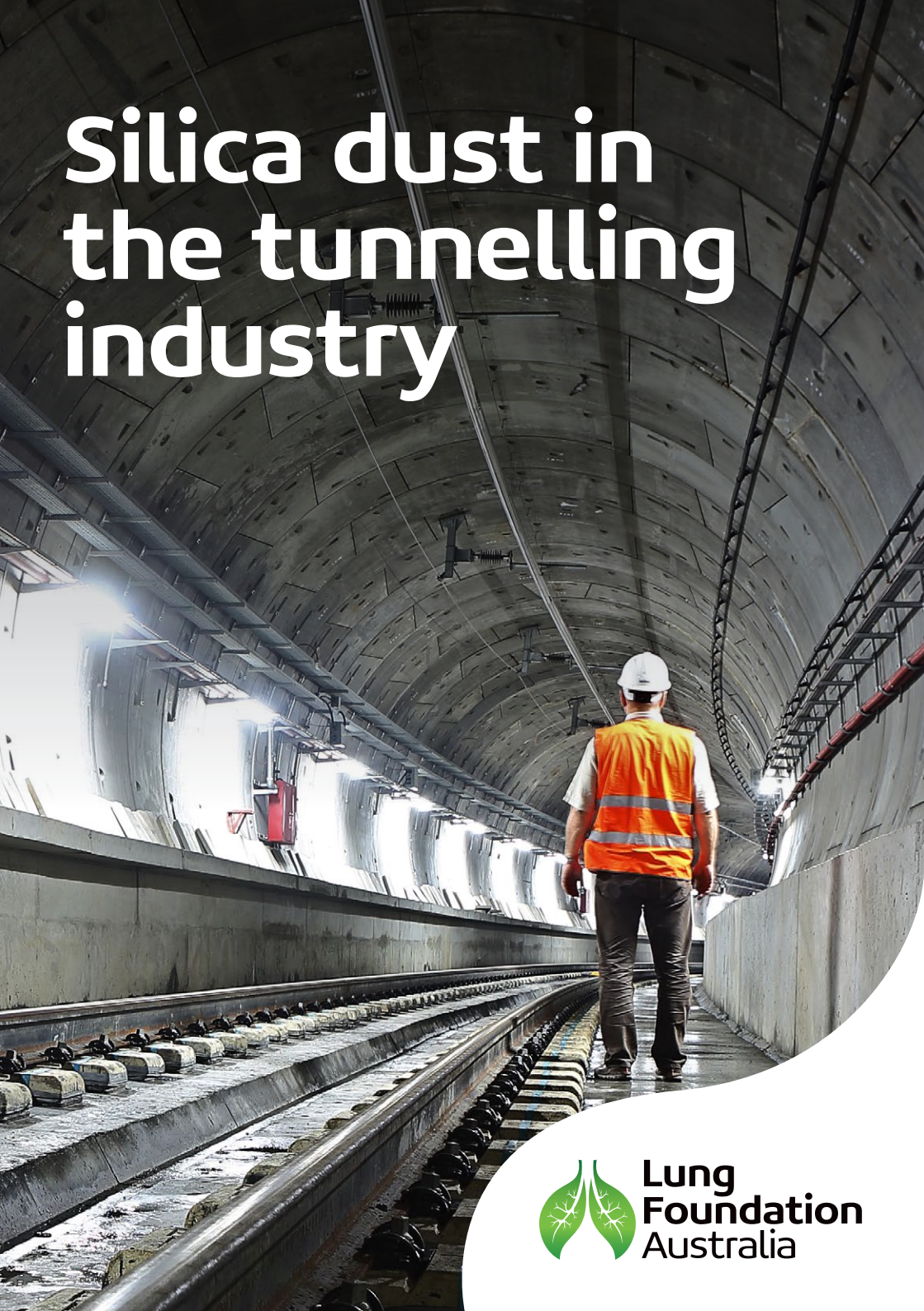
Silica dust in the tunnelling industry



Lung Foundation Australia

Knowing how to reduce your exposure to silica dust in the workplace can protect you and your mates' lung health.

What is silica?

Silica is found in most hard rock tunnelling operations because it occurs naturally in the earth's crust.

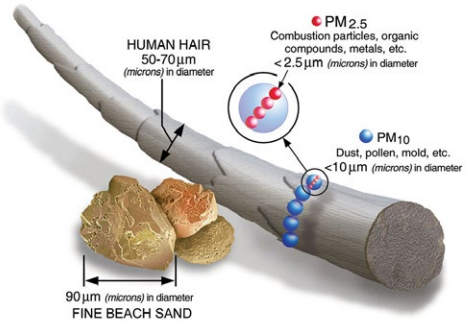
It can be found in most rock, limestone, and sandstone during tunnelling but also in concrete or cement building materials that may be encountered during the tunnel demolition phase.

What is silica dust and why is it harmful?

Silica dust is generated when silica-containing materials are cut, crushed, drilled, ground, polished, sanded, sawed, or disturbed with force.

Silica dust can range in size from very small (less than 10 micron or micrometres in diameter) to larger particles. When silica dust is less than 10 micron or micrometres, it is known as respirable. These particles are small enough to stay in the air and when breathed in, they penetrate deep into the lungs. It is safest to assume that if you are working on any silica-containing material that you may be exposed to the fine and invisible silica dust.

Silica dust size comparison:



Source: https://www.maqohsc.sa.gov.au/respirable-crystalline-silica

Breathing in silica dust can lead to silicosis and other diseases such as lung cancer, chronic obstructive pulmonary disease, rheumatoid arthritis, chronic kidney disease and other autoimmune conditions such as scleroderma.

It is estimated that almost 600,000 Australian workers are currently exposed to silica dust.[1]

If you work in the tunnelling industry, it is likely you are exposed to silica dust. The most common examples of construction processes that pose a risk are the ones that use high energy cutting and drilling or any work that generates a lot of dust in enclosed, poorly ventilated spaces.

Reducing your exposure

Everyone deserves the right to be safe at work and your lung health is no exception.

All tunnelling companies and employers have a legal obligation to manage the risks to workers' health and safety. While certain regulations may depend on the state or territory you work in, their duty to ensure you can work without risk to your health remains.

All workers have a responsibility to care for their own health and safety. You must follow all reasonable instructions given and work in compliance with any training that you have undertaken.

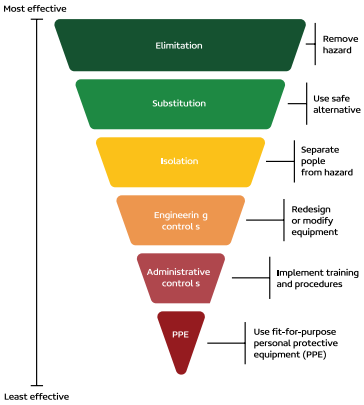
Not all control measures will be possible to follow in all workplaces, so it is important to consider what is achievable and what will have the most impact on reducing your exposure to silica dust.

[1]Carey, Renee, and Lin Fritschi. Edited by Deborah Vallance et al., Australian Council of Trade Unions, 2022, *The Future Burden of Lung Cancer and Silicosis from Occupational Silica Exposure in Australia: A Preliminary Analysis, https://www.curtin.edu.au/about/wp-content/uploads/sites/5/2022/07/FEFreport_formatted.pdf. Accessed 28 Aug. 2023.*

Hierarchy of Controls

The most effective way to reduce your exposure to silica dust is by following the Hierarchy of Controls, which organises control measures from the highest level of effectiveness (Elimination) to the lowest level (PPE). Following this hierarchy can reduce your risk of developing silicosis or other silica-related diseases.

The highest and most effective control measures involve preventing your inhalation of silica dust. Typically, these controls require your employer to design, supply and/or maintain the higher order, engineering controls.



Below are some examples of control measures that can be implemented within a tunnelling environment. While your employer is responsible for implementing control measures, they may need your support in determining the most appropriate ways to implement these.

Elimination: Not using silica-containing materials or processes that generate dust

- Will generally require you to stop work which may be necessary in cases of unprotected and prolonged exposure to high concentrations of silica dust.

Substitution: Using alternative materials that have a lower silica content or opting for lower dust generating methods

- Use of lower energy rock breaking methods or moving from dry to wet drilling.



Isolation: Separating workers from silica dust

- Enclosures around transfer points including covered conveyors and stockpiles or the use of curtains
- Vehicles with an enclosed pressurised cabin and door seals
- Designated enclosed and clean areas for rest and breaks without silica dust.



Engineering: Redesigning or modifying equipment and processes

- The ventilation system should be designed to provide clean air throughout the tunnel during construction, tunnel use and maintenance
- Localised extraction ventilation for dust during excavation, post-blasting, operating a large plant and other activities such as maintenance
- Cross passage ventilation and face extraction ventilation
- On-tool dust extraction at key dust sources of tunnel boring machines (TBMs) at the cutter head and conveyor transfer point
- Using water sprays on cutting equipment or over muck heaps and spoil conveyors
- Changing the direction of the exhaust of tunnel vehicles (from pointing down to pointing up) to minimise the dust that is created.



Administration: Implementing training and procedures

- Washing facilities to remove dust from clothes and boots
- Areas where silica containing dust has deposited or accumulated are regularly wiped or cleaned with an industrial high-efficiency particulate air filter vacuum
- Inspection plans to compare the actual geological conditions as the excavation progresses with the assumed conditions
- Shift rotation policies to reduce exposure
- Avoiding disturbance of dried mud, slurry and spoil
- Following administrative policies such as Safe Work Method Statements (SWMS) and other training as provided by your employer.



Personal Protective Equipment (PPE): Using fit-for-purpose PPE

- Wearing approved and correctly fitted respiratory protective equipment. This includes face fit testing to ensure a proper seal.
- Following the correct use, cleaning and storage of equipment.



You should never rely solely on PPE to protect yourself from silica dust. It is the lowest Hierarchy of Control measure .

Workplace Exposure Standard
Under legislation, a person conducting a business or undertaking (PCBU) must ensure that no person in the workplace is exposed to hazardous agents, such as silica dust, at a level exceeding the Workplace Exposure Standard (WES). For silica dust, the WES must not exceed **0.05mg/m^3 over 8 hours.**

Health monitoring

Health monitoring (also referred to as health surveillance) involves monitoring a worker's health due to their exposure to hazardous agents like silica dust. It helps to identify any changes in a worker's health – which can also show that control measures are not working properly.

Health monitoring must be provided to workers who are carrying out ongoing work using, handling, generating or storing hazardous chemicals, like silica dust, and there is significant risk to their health because of this exposure. This must be organised and paid for by your employer – it is a legal requirement.

If you are unsure whether you should be participating in health monitoring, and your employer is not providing the information you need, you can contact:

- Your Health and Safety Representative (HSR) or union representative
- Your state / territory work health and safety regulator
- An Occupational Hygienist.

Regardless of whether you participate in health monitoring, it is important to discuss your workplace exposure with your doctor, even if you are not experiencing any symptoms. Speaking to your doctor about the type of silica work you do, how often you are doing this work and what control measures you are using will allow them to have a more accurate understanding of your risk of silica-related diseases.

Where to find more information

To find out more information about silica dust in your workplace:

- Talk to your employer about protecting your lung health in the workplace, including health monitoring
- Contact your state or territory work health and safety regulator
- Speak to your HSR or union representative
- Contact an Occupational Hygienist
- Visit Lung Foundation Australia's **website**.

External links

Safe Work Australia
www.safeworkaustralia.gov.au

Australian Institute of Occupational Hygienists (AIOH)
www.aioh.org.au

MATES
www.mates.org.au

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