



## Silica Dust Awareness

This presentation was produced to raise awareness of the risk associated with exposure to dusts and silica during tunnel construction

Every day, across the many tunnels being constructed in Australia, workers, supervisors and managers are living with silicosis from historical exposure to silica dust

This package has been developed by volunteers of the *ATS Air Quality Working Group*, drawing on the collective experience of those working across some of Australia's largest tunnelling projects

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# Air Quality Working Group Information

*During the period from November 2017 through to November 2018, the AQWG membership collectively produced reference material for purposes of communicating information that currently does not exist in the tunnel construction industry's body of knowledge. There are 12 parts to the information package, and each part must be considered in the context of the other. This package represents Part 3 of 12 total parts as listed in the table below. Documented material is considered to benefit the wider tunnelling industry and therefore is freely available on the ATS website.*

Part	Document Title	Document Reference
Part 1	NSW Air Quality Working Group Background & Methodology – Silica Dust Exposure and the Tunnelling Industry	Doc No. AQWG_0_0.07
Part 2	Good Practice to Control Silica Dust Exposure During NSW Tunnel Construction	Doc No. AQWG_1_0.08
Part 3	Silica Dust Awareness Package	Doc No. AQWG_2_0.21
Part 4	Silica Dust Awareness Package Speakers Notes	Doc No. AQWG_2a_0.04
Part 5	Design and Procurement - Industry Considerations	Doc No. AQWG_3_0.09
Part 6	Scrubber System - Case Study	Doc No. AQWG_4_0.09
Part 7	Ventilation During Tunnel Construction - Industry Considerations	Doc No. AQWG_5_0.08
Part 8	Portal Misting System - Case Study	Doc No. AQWG_6_0.05
Part 9	Roadheader Cabin Air Filtration - Case Study	Doc No. AQWG_7_0.06
Part 10	Respiratory Protective Equipment - Industry Considerations	Doc No. AQWG_8_0.07
Part 11	Monitoring RCS Exposure - Industry Considerations	Doc No. AQWG_9_0.07
Part 12	Health Monitoring for NSW Tunnel Construction Workers – Industry Considerations	Doc No. AQWG_10_0.14

***“One of the hardest things to hear is the doctor tell you that you have an incurable lung disease”***

Brendan Gilheany, Superintendent  
30 years in tunnelling



# Dust and silica in tunnelling

Cutting into quartz-containing material such as **Sandstone, Shale,** and **Concrete** creates **dusts** and **silica**

High risk tasks include:

- Tunnelling into rock such as sandstone and shale
- Shotcreting, including wet methods
- Drilling and grouting
- Cutting into concrete
- Heavy plant transporting spoil
- Loaders picking up and moving spoil
- Relocating ventilation



# It's what you can't see that is the problem

- Silica dust is more than 15 x smaller than a piece of human hair
- It's very difficult to see silica dust underground
- It can stay suspended in air for many hours after larger dust particles have settled out
- It's small enough to reach the alveolar regions of the lung
- Over-exposure causes many diseases including silicosis, chronic obstructive pulmonary disease (COPD) and lung cancer



*“Silica exposure can  
come from anywhere.  
Even from washing  
clothes covered in mud.”*

**Kristy Thornton, Occupational Hygienist**

# It's what you can't see that is the problem

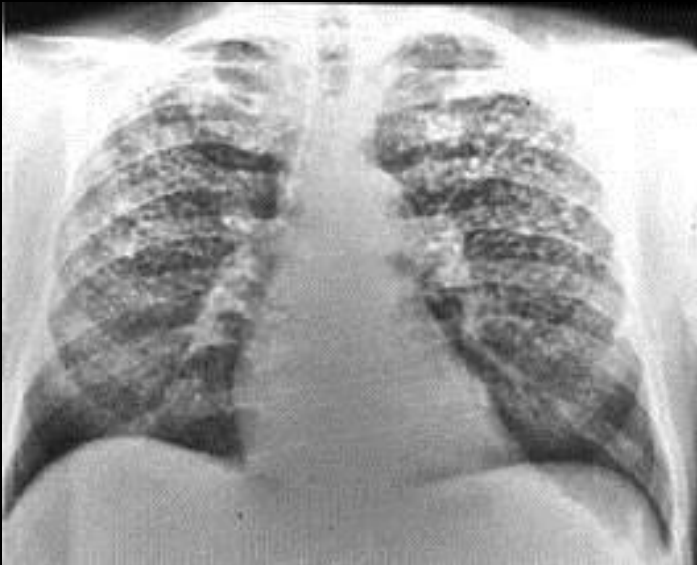
- Some work groups will need to use ventilation, dust suppression and/or respiratory protection
- This may be needed in areas that don't appear to be dusty
- It is important to follow site rules on dust control even if you don't see dust







*Normal x-ray*



*X-ray showing silicosis*

Over exposure to silica dust can cause a lung disease known as **silicosis** and **lung cancer**

## **These diseases have no cure**

Symptoms of silicosis include chronic dry cough and shortness of breath with exercise

Silicosis usually results from chronic low level exposure, however an acute form is also known which can be fatal within months

Doctors can diagnose these diseases through health monitoring which includes lung function testing and an X-ray

Tuberculosis and rheumatoid arthritis are more common in people with silicosis

Silicosis may progress even after removal from silica dust exposure



# GOLDEN RULES

1. Minimise dust generation
2. Good ventilation
3. Clean cabins
4. Use water
5. Use respiratory protection
6. Routine measurement
7. Health Monitoring

# Minimise dust generation

- Consider how your actions generate dust and where the dust will go
- When mucking, avoid dragging the bucket across hard rock as this can generate high levels of dust



# Ventilation

- Only work in ventilated areas
- Keep extraction as close to the face as possible
- If ventilation must be turned down for any reason (e.g. shotcreting) then use additional control measures such as respiratory protection



***“I’ve worked in tunnel construction for 25 years. In hindsight, I wish we had the focus on reducing exposure that we do today”***

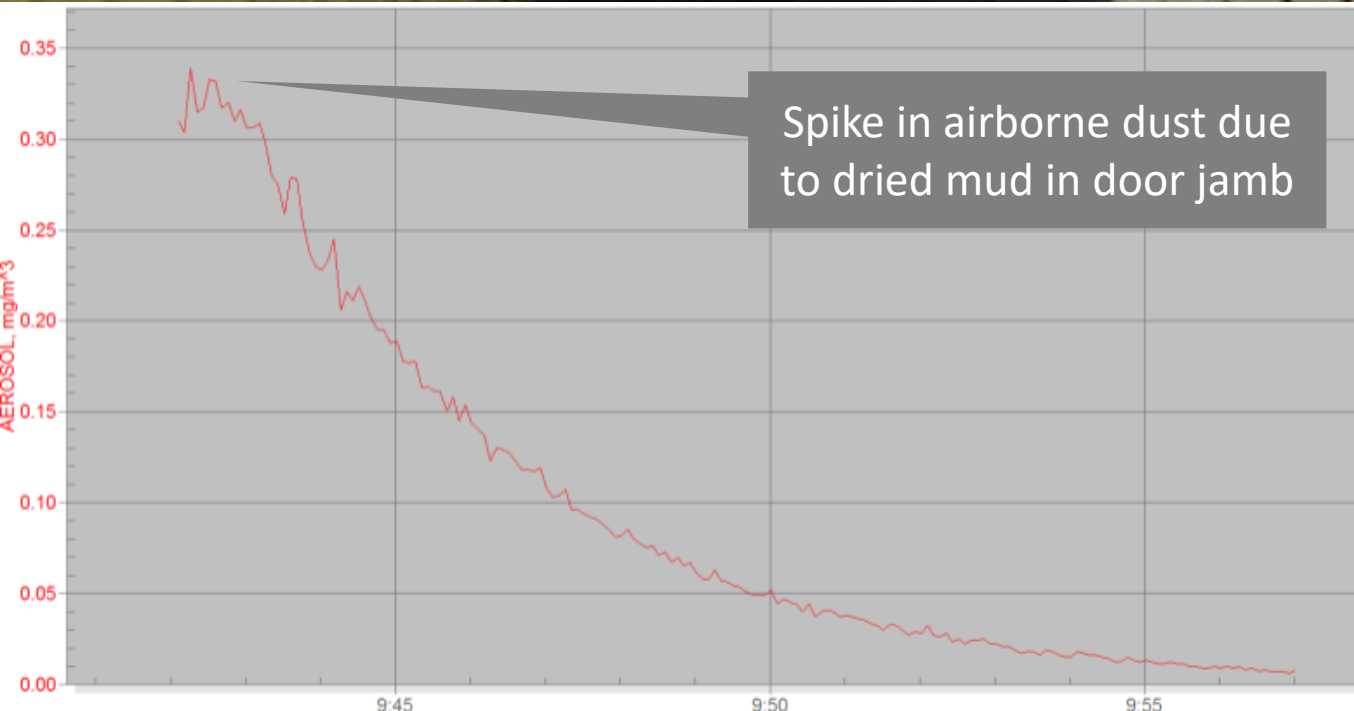
Marty Bell, Plant Manager



# The cabin is the throne

- ✓ Keep doors and windows shut (whether in or out of use)
- ✓ Cover fabric seats with vinyl seat covers or leather as dust gets stuck in fabric easily
- ✓ Don't use a brush/broom which puts the dust in the air, use a HEPA vacuum or wet methods (wet cloths) instead
- ✓ Clean mud from boots before getting in (or take them off before getting in)
- ✓ Change over your clothes on a daily basis to prevent dust build up from mud drying
- ✓ Maintain air filtration systems regularly

# Dried Mud



- Dried mud forms fine dust particles
- Dust is easily disturbed and gets into the air
- Simply closing the cabin door can cause high levels of airborne dust in the cabin
- Vibration in the cabin will also cause dust to become airborne
- You can be exposed to high levels of silica dust just from opening and shutting the door

# Water is wonderful

- Wash down equipment before use and maintenance (e.g. vent bags, road header picks)
- Use fixed dust suppression fitted to equipment rather than hand-held water sprays
- Misting sprays help drop out fine dust particles
- Wet down blast rock & spoil before loading out
- Keep the floor of the tunnel wet



# Water is wonderful

- Silica dust has a small particle size so any water used to capture the dust also needs to be small in size
- Garden hoses or high-pressure hoses won't drop out silica dust from the air
- Fine "mists" or "misting systems" are used for this purpose

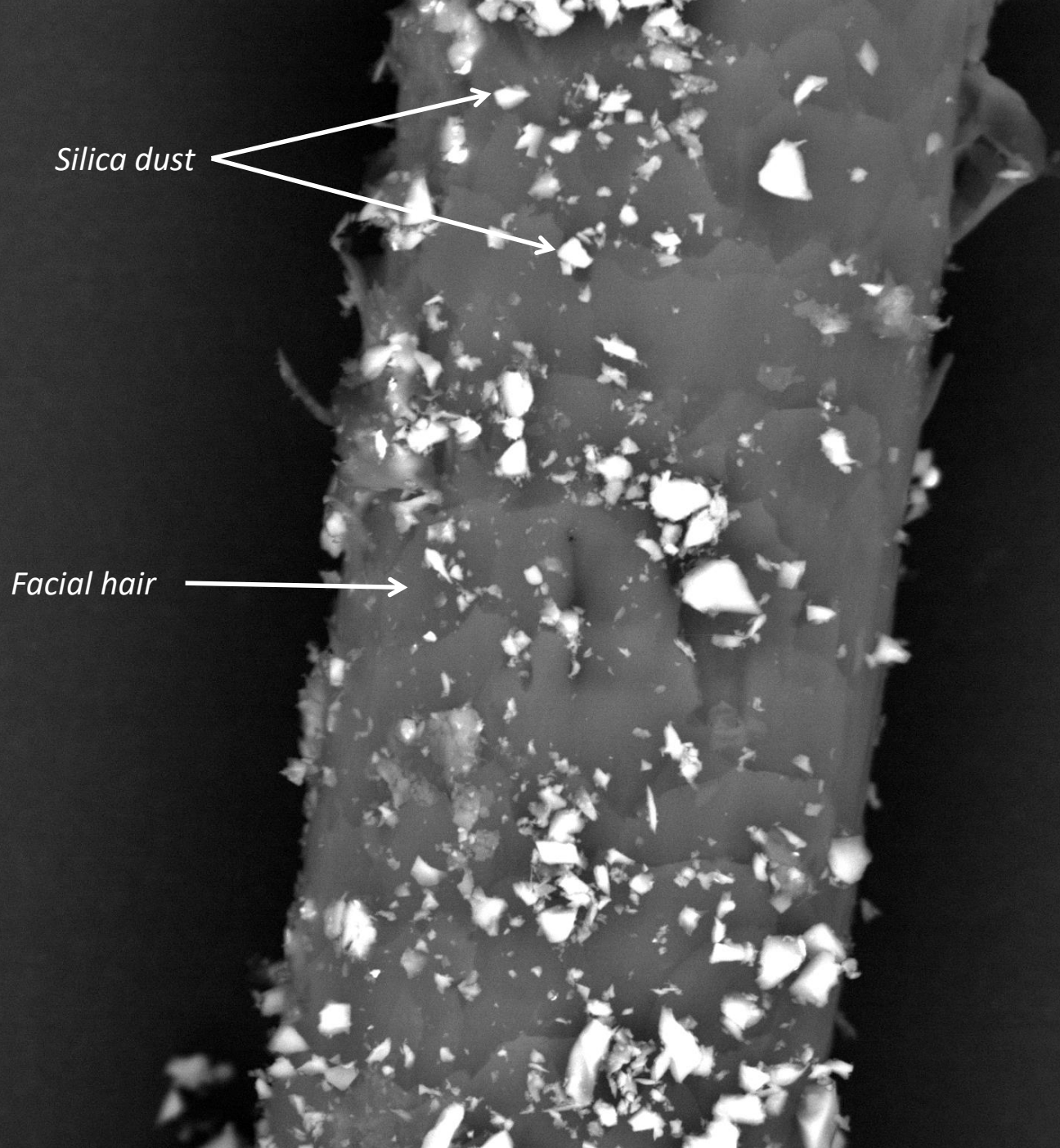


# If respiratory protection is required – wear it


- Don't take it off to talk or drink (go to a respite area)
- Be clean shaven (when wearing close-face fitting respirators)
- Be fit tested for the make and model you need to wear
- Replace it if it gets wet, or harder to breathe
- Keep respirators stored in a clean area



# Clean Shaven



- Silica dust is much smaller than facial hair
- If you use a respirator that relies on correct facial fit to be effective (such as a dust mask), then you must be clean shaven to prevent facial hair interfering with that fit

A photograph of a tunnel interior, likely a construction site. The scene is dimly lit, with a bright yellow light source in the distance, possibly a tunnel boring machine or a large lamp. The air is filled with dust or smoke, creating a hazy atmosphere. The perspective is from within the tunnel, looking towards the light.

*“Your tomorrows health,  
is about the actions you  
take today. Wear your  
dust mask for you & your  
families sake.”*

Grant Andersen, Construction Manager  
30 years in tunnelling

# Measure it

- Silica dust is invisible so the only way to know how much there is in the air is to measure it
- Measurement of silica dust needs to be done regularly to understand if control measures are working effectively
- Monitoring pumps fitted to workers draw in air to a filter paper which is analysed by a NATA accredited laboratory
- Occupational hygienists do this monitoring and the results are posted on site noticeboards



# Measure it

Silica dust exposures have been measured to be more than the Workplace Exposure Standard in tunnelling

This means that routine personal exposure monitoring and respiratory protection is often required

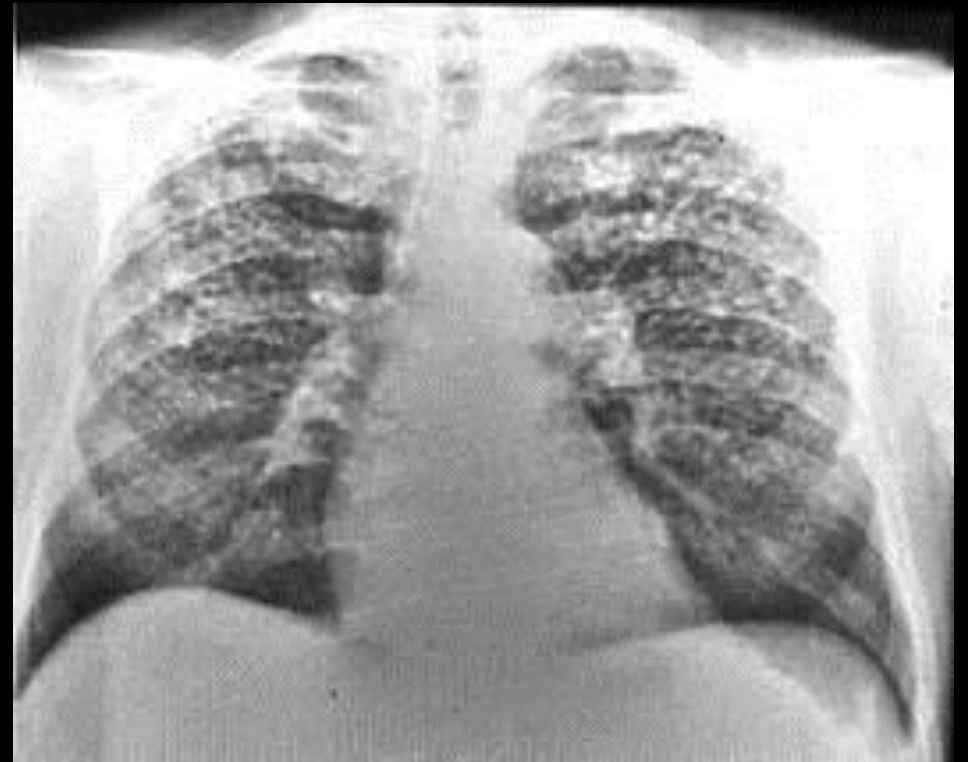


**The following roles are typically measured on a routine basis:**

- Supervisors
- Back-end Work Crews
- Heavy Plant Operators
- Roadheader Operators
- TBM Work Crews
- Tunnellers
- Mechanics & Fitters
- Electricians
- Shotcrete Crews
- Cut & Cover Operations

# Health Monitoring

- Health monitoring for crystalline silica happens before you start work
- It is repeated every 12-months
- Health monitoring picks up any changes to your lung function and can detect early stages of silicosis and other lung diseases
- It involves a lung function test and an X-ray
- You should keep a copy of your reports and take them each time you go through health monitoring



# Summary

The background image shows a dimly lit tunnel construction site. In the foreground, two workers wearing orange high-visibility safety vests and white hard hats are seen from behind, looking towards the tunnel's interior. The tunnel walls are dark and appear to be made of concrete or rock. Various pieces of equipment, including pipes and cables, are visible along the walls. The overall atmosphere is industrial and somewhat dark.

- Silica dust is common in tunnelling
- Remember to follow the golden rules for dust control:
  1. Minimise dust generation
  2. Good ventilation
  3. Clean cabins
  4. Use water
  5. Use respiratory protection
  6. Routine measurement
  7. Health Monitoring



# More Information



[Good Practice to Control Silica Dust Exposure during NSW Tunnel Construction](#)



**NSW**  
GOVERNMENT

SafeWork NSW

[SafeWork NSW Resources](#)

[NSW Work Health and Safety Regulation 2017](#)

# Other Resources

## Safe Work Australia

[Safe Work Australia Virtual Seminar Series – Silica Dust](#)

[Crystalline silica - Hazardous Chemicals Requiring Health Monitoring](#)

[Health Monitoring for Exposure to Hazardous Chemicals - Guide for workers](#)

[Health Monitoring for Exposure to Hazardous Chemicals - Guide for persons conducting a business or undertaking](#)

## Other Australian Resources

[Australian Institute of Occupational Hygienists \(AIOH\) Position Paper on Respirable Crystalline Silica](#)

[Cancer Council](#)

[Workplace Health and Safety QLD: Tunnelling road header operations: dust conditions and their control](#)

## International Resources

[International Tunnelling Association – Health and Safety in Works](#)

[Crossrail Legacy Learning – Jenny’s Story](#)

[Breathe Freely Campaign](#)

[Center for Disease Control and Prevention](#)

[Health and Safety Executive, UK](#)