2024 Review of the Dust Diseases Scheme, Public Hearing 29th November 2024
Questions on Notice to Kate Cole OAM, PhD candidate at the University of Sydney

Question 1. Are you able to provide specific examples of instances where employers failed to implement adequate dust control measures, including the types of failures and the resulting consequences?

a. If you are unable to provide specific examples, are you able to explain what a scenario such as that might look like?

Based on the reports obtained through freedom of information processes, the types of failures in tunnelling have included:

- Heavy plant being used without enclosed cabins, or where cabins were present, the cabin was left open or operated with the windows down (e.g. due to broken air conditioning).
- Inadequate air movement being present underground, with measurements demonstrating an air velocity less than 0.5 metres per second (m/s).
- Air being supplied to shaft structures under construction from areas where airborne contaminants were present (i.e. air was not sourced from the outside, but rather air was sourced from inside an enclosed shed where contaminated air was present and subsequently delivered to other work areas).
- Ventilation extraction not being located where dust emissions could adequately capture the dust at the source of generation. This then led to dusts travelling throughout the work area and exposing other workers underground.
- Dust suppression being absent, or where it was present it was largely ineffective at suppressing the dust.
- Cleaning heavy plant cabins and other areas of the site using dry methods (e.g. brooms), which liberated settled dust into the air which was then able to be breathed in by workers.
- Absence of signage denoting the need for respiratory protection.
- Safe Work Method Statements did not identify dust generation risks, and suitable control measures were not identified.
- Inadequate levels of respiratory protection being provided to workers. For example, the levels of RCS in air exceeding the level of protection provided by a P2 respirator (dust mask).
- Where close-face fitting respiratory protection was provided (e.g. dust mask), workers were not always face fit-tested, workers were not always clean shaven, and workers did not always use the respiratory protection when exposed to dusts.

The above failures have been documented in reports where workers have been exposed to respirable crystalline silica (RCS) at concentrations more than the Workplace Exposure Standard.

Question 2. Are you able to provide information on the types of dust monitoring equipment used in tunnelling projects, including their accuracy, limitations, and suitability for different tunnelling environments?

Please refer to the Submission by the Australian Institute of Occupational Hygienists (AIOH) (Submission 1) which contained a table outlining the three main methods used for air monitoring for RCS and included information on the function and considerations for each method. In summary, three methods are used. These are:

1. Personal exposure samplers, which involves using personal samplers worn by workers in the breathing zone to measure RCS exposure during shifts, including breaks (see image overleaf[1]). The dust obtained by this method is subsequently weighed and analysed for crystalline silica[2] content by a NATA accredited laboratory.
2. Static (fixed) sampling, which involves the same samplers as the above method, but they are placed in specific areas to identify sources of dusts and to assess process and control effectiveness.
3. Real time monitoring, which uses direct-reading devices to count dust particles and make the results visible on the devices screen.

[1] https://www.rshq.qld.gov.au/miners-health-matters/prevention
[2] The analysis is for a specific polymorph of crystalline silica e.g.: α-quartz, cristobalite, tridymite etc.

Image: Personal exposure sampling

While all three methods are suitable for use in tunnelling, it is only the first method listed (personal exposure monitoring) that can be used to demonstrate compliance with the Workplace Exposure Standard[3]. There is a fundamental relationship between exposure to RCS and the risk of disease. In addition to having a compliance function, the results of personal exposure monitoring are a key part of understanding how exposure relates to disease outcomes.

There are various issues which can impact accuracy of any measurement of airborne contaminants, including dusts and RCS. For example, errors may occur during both the sampling in the workplace and with analytical techniques used. Air monitoring through personal exposure monitoring should be performed by experienced and competent occupational hygienists following an Australian Standard AS2985-2009 *Method for sampling and gravimetric determination of respirable dust,* with samples analysed by a NATA-accredited laboratory. Recognising the uncertainties that exist, the AIOH have published a Technical Paper on minimising uncertainties when sampling and analysing RCS[4] to further improve reliability and minimise uncertainties when sampling for RCS in the workplace.

No standards or technical documents of a similar nature exist for the use of real time monitoring devices. The use of real-time monitoring devices are very useful to delineate areas with "high" or "low" levels of dust. The level of uncertainty with respect to their output however is significantly higher than through personal exposure sampling. For example, two devices of the same make and model have been known to return widely variable results. Further, displayed results can reduce over time as the accuracy of a device's sensors deteriorate, drift or are 'overwhelmed' in high dust environments.

Question 3. You recommended requiring certified occupational hygienists to oversee air monitoring. Can you elaborate on the specific competency standards that should be met by individuals conducting air monitoring in tunnelling projects?

Tunnelling presents complex work environments that necessitate qualified and competent occupational hygienists. I recommended that a Certified Occupational Hygienist (COH)® oversee air monitoring in tunnelling projects.

For context, a COH has completed relevant tertiary studies in occupational hygiene or a related field; has been working in the field for more than five years in a professional capacity, and has demonstrated a satisfactory level of professional knowledge, competence, communication skills and knowledge of Australian health and safety legislation through successful completion of an oral

[3] https://www.safeworkaustralia.gov.au/sites/default/files/2024-09/guidance-interpretation-workplace-exposure-standards-airborne-contaminants-revised-sep24.pdf
[4] https://www.aioh.org.au/product/the-aioh-technical-paper-minimising-uncertainties-when-sampling-and-analysing-rcs/

examination. A COH also must continue to demonstrate an ongoing commitment to excellence and maintain their professional currency through ongoing professional development[5].

COHs hold specialised skills and knowledge that contribute to significant improvement. For example, they design and apply rigorous frameworks including systematic processes for identifying and managing risks. Their expertise includes interpreting data, developing targeted controls and monitoring plans, and using advanced statistical techniques to evaluate uncertainties in exposure.

WorkSafe Queensland[6] provides straightforward requirements that would be suitable for application in NSW tunnelling which are provided below for quick reference:

Task	Who is qualified
Plan air monitoring at the workplace (including establishing similar exposure groups and develop a sampling plan)	Certified occupational hygienist, or a recognised equivalent competency under an international certification scheme (e.g., certified industrial hygienist).
Conduct personal exposure monitoring at the workplace	• Certified occupational hygienist; or • A recognised equivalent competency under an international certification scheme (e.g., certified industrial hygienist); or • Occupational hygiene technician.
Interpreting the results of air monitoring, and drawing conclusions	Certified occupational hygienist, or a recognised equivalent competency under an international certification scheme (e.g., certified industrial hygienist).

<u>Certified occupational hygienist competencies</u>
A certified occupational hygienist is a full or fellow member of the Australian Institute of Occupational Hygienists (AIOH) who has been assessed by examination as demonstrating a high standard of knowledge, competence, professional judgement and problem-solving skills in the complex management of health hazards in the workplace.

<u>Occupational hygiene technician competencies</u>
Occupational hygiene technicians may not be tertiary trained, but they have achieved competency to conduct RCS exposure monitoring in a workplace as they have completed specific training in respirable dust sampling.
Some examples of training include:

- Occupational Hygiene Training Association Series 5 modules W201 Basic Principals of Occupational Hygiene, or W501 Measurement of Hazardous Substances.
- BSBWHS409 Respirable Dust Monitoring (QLD).

The AIOH provides also guidance on the selection of occupational hygiene services specifically for RCS in air monitoring[7].

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[5] https://www.aioh.org.au/membership/coh/
[6] Managing respirable crystalline silica dust exposure in construction and manufacturing of construction elements Code of Practice 2022 https://www.worksafe.qld.gov.au/laws-and-compliance/codes-of-practice/managing-respirable-crystalline-silica-dust-exposure-in-construction-and-manufacturing-of-construction-elements-code-of-practice-2022
[7] https://issuu.com/thefilter/docs/occupational_hygiene_services_oh_aioh_silicahub?fr=sZmY4NzYzODc5NTU

Question 4. What specific elements should be included in a code of practice for air monitoring in tunnelling to ensure consistency and effectiveness across projects?

The specific elements relating to air monitoring that are needed in a code of practice include:

- The need to outline competencies of those who plan, conduct and interpret air monitoring. Air monitoring should be undertaken by a person who has acquired the knowledge and skills to carry out the task, from training, qualification or experience (please see answer to previous question).
- The need to specify details around sampling airborne respirable dust and RCS. For example:
    - Discerning the difference between static and personal air monitoring when determining compliance with the Workplace Exposure Standard, to clarify that it is only personal monitoring that is suitable for compliance purposes;
    - Requiring sampling to be performed on both day and night shift;
    - Providing more prescription around the number of samples to be collected per work group, which are commonly referred to as similar exposure groups (SEGs);
    - Providing more prescription around the frequency of sampling. There is a high degree of variability in the work environment and control measures applied in tunnelling. It is for this reason that monitoring on an annual or quarterly basis is often inadequate to determine that control measures are sufficient to protect worker health. It is recommended that monitoring be performed on a minimum of a monthly basis across SEGs where workers are at significant risk of RCS exposure. More frequent monitoring may also be suitable in certain situations.
- Including requirements for ventilation testing and minimum ventilation air velocities to be achieved where persons are required to work.
- Specifying the parameters to be tested to include: respirable dust, the types or polymorphs of RCS that will be present in the rock to be tunnelled, diesel emission gases and diesel particulate matter (DPM) as a minimum.
- There is a need to standardise the names and groupings of similar exposure groups (SEGs). For example, a SEG may be known on one tunnelling project as "*electricians*" and it may be known as "*trade services workers"* on another tunnelling project. The former would include a smaller number of workers, while the latter would include many more workers. This rigour in job title and SEG name has been used successfully to standardise large data sets in mining workplaces for some time.
- Mandating the need to re-sample "*invalid*" samples immediately after noticing a failure. For context, there are instances where the results of RCS in air testing are categorised as "*invalid*" or "*VOID*" by the occupational hygienist and the results are not reported. This occurs most commonly where the amount of dust that is captured by the sampler is excessive, and the personal sampling pump has been unable to maintain the required flow rate within the tolerance stated in the Australian Standard. There are many examples of this occurring where workers operate Roadheaders or Surface Miners, both known as high dust generating activities. Unfortunately, what happens in industry is that these "*invalid*" samples are not re-tested until the following month, where they may again fail to provide a result, which consequently repeats leaving workers without a result for RCS in air in a known high-risk scenario. These "*invalid*" samples are not reported to SafeWork NSW as technically they were not a valid exceedance of the WES. A requirement is needed to mandate the re-testing of these samples immediately after noticing a failure, which would be the next day/shift rather than the next monitoring round. The Code could also specify how these 'dust overload' sampling occasions can be minimised, as they have been in mining workplaces with similar challenges.
- Including information on a standardised prescriptive method to determine compliance with the Workplace Exposure Standard. For example, the application of a methodology such as the process outlined in the European Standard EN 689:2018 *Workplace exposure - Measurement of exposure by inhalation to chemical agents - Strategy for testing compliance with*

occupational exposure limit values. That Standard appropriately deals with statistical methods that are directly relevant to compliance decisions in workplaces. At present, no prescription or consistent standards in this area exists. Addressing this would provide clarity and uniformity across industry, driving better compliance and health outcomes.

- Mandating that workers are to be provided with their individual air monitoring results in a suitable form for their personal records where they have participated in personal exposure monitoring.
- Mandating that results of air monitoring of RCS be made readily available to any party who requests them and that de-identified results and trends in air quality / ventilation are posted or otherwise made visible in the tunnelling workplaces.

Note that many of the above items exist in some form in the mining industry. The *NSW Work Health and Safety (Mines and Petroleum) Regulation 2022* partly addresses some of these items for example. Tunnel construction is not regulated in the same manner as an underground mine, and therefore many of the necessary regulatory elements that are well enshrined in mining are absent in tunnelling. A code of practice could fill these gaps. A better solution would be to include the necessary items into the WHS Regulation specific to tunnel construction and to supplement that Regulation with Guidelines where necessary.

Question 5. If the scheme were to include non-lung diseases related to silica exposure, what specific diagnostic criteria should be used to establish sufficient causality and eligibility for benefits?

I am unable to answer this question as my expertise does not extend to diagnosis of silica-related disease. I need to defer this question to representatives of the Royal Australasian College of Physicians.

Question 6. How much variability is there between shifts typically when it comes to dust exposure?

In my experience, there is a high degree of variability between shifts when it comes to dust exposure. That is because the amount of dust exposure is heavily influenced by many factors including the many sources of dusts and RCS generated underground along with the presence and effectiveness of various dust control measures.

The extent of variability can be assessed through reviewing the geometric standard deviation (GSD) of the RCS exposure data for each Similar Exposed Group. For example, a GSD around 1.5 generally indicates low variability; 2.5 generally indicates a moderate variability; and a GSD of greater than 3.5 generally indicates a high variability.

To quantify this variability, I reviewed RCS exposure data from 20 Similar Exposure Groups (SEGs) where RCS exposure had been assessed from one tunnel project in Sydney, NSW. This information was obtained through Freedom of Information requests. In summary, it showed that half of the SEGs had GSDs above 3.5, indicating high variability. The remainder had a moderate variability. None had low variability.

Question 7. Concerns were raised about the quality and frequency of fit testing for PPE. How often is fit testing conducted, and what are the specific challenges in ensuring proper fit testing for all workers?

Respirator fit testing is required by Australian New Zealand Standard AS/NZS1715. This Australian Standard is now specifically called out in the crystalline silica regulations in NSW.

Fit testing is to be performed before a user wears a respirator on the job and should be assessed at least annually. In addition, fit tests should be performed:

- Whenever a different size, style, model or make of respirator is used.
- When any facial changes occur that could affect fit, such as significant weight fluctuation or dental work

Some challenges in ensuring proper fit testing for workers include:

- Awareness by employers of the need for them to provide fit testing for close face fitting respirators (e.g. P2 masks);
- The presence of facial hair by workers, as fit testing cannot be performed where facial hair interrupts the seal of the respirator.

RESP-FIT is a national respiratory protective equipment fit testing training and accreditation program developed to improve the competency of fit testers against both the Australian and international ISO respirator standards for fit testing. RESP-FIT was developed by the AIOH through close collaboration with many industry stakeholders.

In my experience, the issue is less about accessing the services of a competent and accredited fit-tester (of which there are many[8]), or the time taken to perform the test (less than 30 minutes) but more about awareness by employers of the requirements for respirator fit-testing to be performed.

There is an increasing trend to use Powered Air Purifying Respirators (PAPRs) such as the 3M Versaflo respirator. These respirators have been used in industry for many decades, including in tunnelling for workers performing higher-risk tasks. It has been only recently that their use has been extended to a wider variety of tunnel construction situations. The reasons why they have not been made available to all workers sooner are unclear but probably relate to factors such as awareness by employers and cost.

Some loose fitting PAPRs such as the 3M Versaflo do not require fit testing and provide a higher degree of protection with cool and clean air without the need for the worker to be clean shaven.

[8] See https://respfit.org.au/