DESIGN AND PROCUREMENT INDUSTRY CONSIDERATIONS

Air Quality Working Group
Information Package - Part 5 of 12

December 2018

Design and Procurement

The Australian Tunnelling Society (ATS) recognises the importance of health and safety in our industry in addition to valuing the strong experience and contribution of its members to support key stakeholders in our ever-growing sector. The ATS recognise that collaboration with industry stakeholders is essential to both raise awareness of the important issue of silica dust control, but also to enable effective strategies to be developed that will ultimately be practical and a positive step forward.

The Air Quality Working Group (AQWG) was formed in 2017 as a collaborative platform to enable industry to work together to develop and implement strategies to improve occupational health outcomes, with an initial focus on respirable crystalline silica ("silica dust").

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 document represents Part 5 of 12 total parts as listed in **Table 1**. Documented material is considered to benefit the wider tunnelling industry and therefore is freely available on the ATS website.

Table 1 – Complete list of material produced by the AQWG

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

Building and Construction - Safety Performance

Construction is one of Australia's poorest performing industries in terms of work health and safety, evidenced by multiple repetitive statistics, with regard to the prevalence of occupational disease. For the 2012-2013 financial year, the estimated total economic cost associated with work-related disease and injury was $61.8 billion, representing 4.1% of GDP for the same reporting period. Unsurprisingly, the construction industry ranked as the third highest contributor to such economic burden, equating to costs of $5.84 billion, of which occupational disease contributed $2.98 billion, or 51%.

Statistics released by Safe Work Australia demonstrate that each year on average, 250 workers will die from an injury sustained at work, while over 2000 workers will die from an occupational disease. Whilst occupational health and safety policies and systems are inherently focused on safety, as such should, all too often there is a failure to adequately focus on work-related health hazards. Such failures are frequently linked to the specific challenges associated with managing occupational health risks; particularly as such hazards can be invisible and insidious in the long latency of their ill effects, with health problems only emerging many years later.

Such statistics and realised shortfalls prompted Safe Work Australia to review the performance of work health and safety among all Australian industries. The review identified the construction industry's inherent hazardous nature results in one of the highest incidence rates and highest number of workers' compensation claims when compared to all other industries. Construction has been nominated by Safe Work Australia as a priority industry for improved performance, with a particular focus on preventing high prevalence occupational diseases.

SafeWork NSW have released many plans to address silica dust control, including the 2017-2022 Hazardous Chemicals and Materials Exposures Baseline and Reduction Strategy, the Work Health and Safety Roadmap for NSW 2022, and most recently, the Building and Construction WHS Sector Plan 2022 entitled, *"Working Together to Improve Work Health and Safety in The Building and Construction Industry*". The plan, in part states *"SafeWork NSW has identified respirable crystalline silica as a priority chemical for the elimination and reduction of exposures to silica dust in the workplace".*

Clients – As an Active Industry Partner

Many different stakeholders may be involved in a building and construction project, each with varying levels of influence and/or control in managing workplace and occupational health and safety risks. One such stakeholder is the Client organisation, both private and government. At the initial AQWG Silica in Tunnelling Workshop, it was identified that the business processes engaged to structure a building and construction Contract, including contract execution, is an area that may support and/or inhibit client participation as an active industry partner.

The most effective risk management methods of controlling silica dust exposure are those that effectively implement the hierarchy of controls i.e. elimination, substitution, engineering, administration and personal protective equipment. However, decisions that enable or preclude the use of "high-level" controls, being design/elimination, are made early in the project life-cycle, and as such, raises the importance of considering such "high-level" control measures at the time that Client organisation begins to plan and commission a project.

Therefore, this document presents several Key Focus Areas that Client organisations may consider, during project planning and commissioning in an effort to support the management

and control of silica dust exposure during building and construction. The Key Focus Areas are:

1. Select construction methodologies and processes
2. Encourage and enable innovative practices
3. Select minimum engineering techniques
4. Select minimum risk management processes
5. Select minimum tender scope

Key Focus Area 1: Select Construction Methodologies and Processes

The magnitude of silica dust exposure differs relative to the tunnel construction method selected. The main methods used in Australia are:

1. Tunnel Boring Machine (TBM) tunnelling, where one or more TBMs are used along with pre-cast concrete segments to line a tunnel wall;
2. Mined tunnels, where road headers, rockbreakers and surface miners are used in conjunction with bolt, mesh, and shotcrete, and also commonly used to construct declines, station boxes, and cross passages which are common to most tunnel projects;
3. Cut and cover, where a shaft or decline is excavated to the required depth, and then an overhead roof support system is installed, which may be backfilled over, such us the case on most all tunnelling projects; and
4. Drill and blast, where the controlled use of explosives is used to break rock for excavation.

Of all the tunnelling methods, TBM tunnelling is likely to result in lower overall exposures to silica dust in the typical range of up to 10 times the Workplace Exposure Standard. In contrast, mined tunnels (including cut & cover) constitute the highest risk, with exposures typically ranging over 10 times the Workplace Exposure Standard, dependant on site-specific factors. Alternative tunnelling methods such as drill and blast may present a lower risk of silica dust exposure, because the action of the blast produces excavated rock in large volumes in areas where workers are not present in the work area.

Although tunnelling Contracts may typically include both a design and construction brief, the brief provided by the Client tends to dictate the overall method of tunnelling used through providing certain constraints as part of the overall concept design. Similarly, silica dust exposures may be harder to manage where parallel tunnelling activities are required, such as where mined tunnelling and back-end works are completed simultaneously.

It is recognised that many factors that are taken into consideration when selecting a tunnel construction method and/or process. Therefore, it is recommended that a Client acting as a key stakeholder, considers effective construction methodologies and processes that eliminate or reduce the risk of worker exposure to silica dust.

Key Focus Area 2: Encourage and enable innovative practices

The construction industry recognises that the most common and applied way to reduce exposure to silica dust during construction is to engage the hierarchy of controls such as design, elimination and engineering etc. In this regard, a key driver from "*good practice*" to "*best practice*" relies on implementing higher-order controls.

To encourage the application of the higher-order of controls and build towards more innovative practices, a Client may consider including realistic "value add" and/or "weightings" provisions in their procurement contracts that particularly consider "best practices" for eliminating or controlling the risk of worker exposure to silica dust. While this may not necessarily translate into the actual construction practices it would produce thought provoking concepts on what can and cannot, in practice, work.

In terms of value to a client, the returns may include industry recognition, community leadership, reduced exposures in PCBU relationships, improved methods of benchmarking, ensuring higher levels of legal compliance, improved ethical standings with other stakeholders and having continuous improvement drivers.

Key Focus Area 3: Select Minimum Engineering Technologies

During mined tunnelling, the use of enclosed, pressurized, and filtered cabins is becoming a more common occurrence in Australian tunnel construction. Large tunnel construction projects are currently leading the industry with this technology, which results in lower exposures to high-risk workers such as roadheader operators.

It is broadly recognised that a Client, as a key stakeholder, is in a position to promote consistency across the industry, which may include selecting a suite of "*minimum engineering techniques*" that control silica dust. For example, where mined tunnelling requires the use of road-headers for tunnel construction, a Client may specify the use of a positive air pressurised, enclosed and sealed cabins, (complete with adequate filtration) to protect a road-header operator.

Key Focus Area 4: Select Minimum Risk Management Processes

The risk of silica dust exposure should be risk assessed in the same way as any other health and safety risk including high risk construction work. As such, it is recommended that Tender documents require the risk of silica dust exposure to be assessed and documented as part of the tenderers response.

The risk of silica dust exposure should be included in a tenderers Risk Register and managed and reviewed at a frequency commensurate with the assessed level of risk.

The tenderer acting as the main contractor must ensure that, where engaged, their subcontractors are informed of and provided the main contractor Risk Register. In turn the subcontractor shall ensure the risk of silica dust exposure is managed and reviewed at a frequency commensurate with the assessed level of risk.

Key Focus Area 5: Select Minimum Tender Scope

It is recommended that Tender documents require the submission of the following documents as part of the Tenderers response:

1. Ventilation Management Plan

This plan should include, but not be limited to, the following:

i. Nomination of a Ventilation Engineer, that shall be dedicated for the entirety of the project, where ventilation is utilised;
ii. Describe the role, accountability, and authority provided to the Ventilation Engineer;
iii. Necessary support resources, to ensure the ventilation process is effective
iv. Design, type, components and layout of the system including temporary power;
v. Describe in detail the different construction phases of the tunnel project and the accompanying changes to the ventilation for each phase, up to permanent operational phase ventilation;
vi. Describe construction HOLD POINTS required to be released or PERMITS required to be authorised by the Ventilation Engineer, before major alterations or reconfigurations of ventilation can be implemented; and
vii. Monitoring action process

2. Occupational Health and Hygiene Management Plan

This plan should incorporate the following elements:

i. Nomination of the Contractors independent Certified Occupational Hygienist (COH)® that shall be dedicated for the entirety of the project.
ii. Necessary support resources to ensure that the COH can function accordingly and effectively;
iii. Describe the role, accountability, and authority provided to the Occupational Hygienist;
iv. Description of the methodologies that will be applied to assess the occupational health risk of exposure to silica dust for the project workforce
v. Description of the methodologies to be applied to control exposure to silica dust, based on the risk management principals and the hierarchy of controls
vi. Description of the process where silica dust exceeds legislative limits as prescribed in WHS legislation (e.g. the Workplace Exposure Standard).

It is recommended that the Ventilation Engineer and Certified Occupational Hygienist (COH)® be named in the Tender Schedules.

Disclaimer

This document has been developed by volunteers of the ATS Air Quality Working Group and draws on the collective experience of those working across some of Australia's largest tunnelling projects. The publication comprises 12 parts, and each part should be considered in the context of the other parts.

The information contained in this document is for general information and educational purposes only; it is not a comprehensive list of all factors to be considered and is not a substitute for legal or technical advice.

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