ROADHEADER CABIN AIR FILTRATION CASE STUDY

Air Quality Working Group Information Package - Part 9 of 12

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Roadheader Cabin Air Filtration Case Study

This document was produced to provide information on control measures that can be used to reduce exposure to dusts and silica during tunnel construction. It 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.

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 9 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

This case study provides information on a roadheader cabin design that was used on a tunnel construction project to protect roadheader operators from exposure to silica dusts during mined tunnelling.

Example of Cabin Design

A custom purpose-built cabin was designed to fit to a Mitsui roadheader. The cabin was built by QMW Industries and is pictured in **Figure 1**.

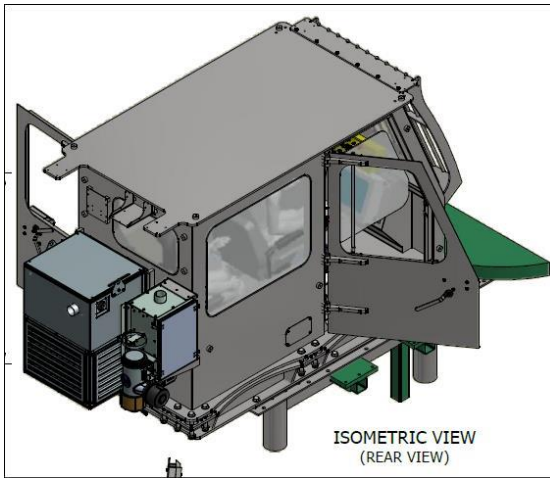

Figure 1: Rear View of Roadheader Cabin

The cabin was designed to have a positive pressure system to prevent contaminated air from entering the cabin. The cabin was also designed to include two operators' seats to enable a new operator to be trained safely. The aim was to overcome an historical issue whereby the door was needed to be kept open and the worker required to stand on the deck during training. This task resulted in reduced visibility and high dust exposures leading to the use of high-grade respiratory protection. By engineering a cabin with two-seats, the system both reduced the risk of exposure and enabled the trainer and trainee to more effectively communicate during this critical task.

There were two main systems used together for providing air conditioning filtration to the cabin:

Fresh Air Filtration
This system fed air from the outside environment through a five-stage filtering system that included a pre-cleaner, cartridge filter, activated media, post filter, and then a HEPA-rated filter. This built up the pressure inside the cabin to 30-40 Pa greater than the outside atmosphere. This system fed approximately 20 litres/sec of filtered air into the cabin. Filter specifications were the Sigma PVV50B2 Purification Unit from Sigma Air Conditioning.

Recirculation Air Filtration. This was a two-part filtering system involving an ejection port prior to the filter to remove large particles from the air stream; followed by the installation of a MERV16 filter. HEPA rated filters were not deemed necessary as MERV-16 filters provided adequate filtration. Filter specifications were the RESPA PFR24 Recirculation unit & PFP24.

The air exhausted from the cabin via normal leakage, however provision for air to exhaust through a dedicated one-way vent and non-closing vents for fresh air is desirable. To maximise effectiveness, pre-filters must be changed or cleaned before every shift and the air conditioning unit must always be turned on as soon as the roadheader starts. A pressure gauge inside the cabin can confirm the positive pressure achieved.

Figure 2: Custom-built roadheader cabin with filters located on the Left Hand Side (rear of cabin)

References and Further Information

www.qmw.com.au
www.sigma-hvac.com

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. Accordingly, you should consult with appropriate professionals and make your own inquiries as to the suitability of the information for your specific purposes.

 While details of suppliers are provided, it is noted that the ATS does not make recommendations on specific suppliers or organisations. Material is provided for information only and Contractors would be expected to make independent enquiries as to the suitability of such for their own use.

The ATS acknowledges and thanks Matt Lennon and Adroito Xavier for providing the information contained herein.