

Silica dust control during demolition



Demolition at Pitt Street North.

Sydney Metro is a new world-class railway for Sydney. Sydney's new metro system is the biggest program of public transport infrastructure in Australia currently under construction with more than 30,700 people working along the new 66-kilometre metro alignment or at one of 31 new metro stations. Sydney Metro has a unique opportunity to leave not only a world class transportation system but also a legacy for future generations. A strategic element of our legacy is to positively influence better outcomes for worker health protection.

Demolition is one of the many activities required to deliver Sydney Metro City & Southwest. More than 65 buildings were demolished by Sydney Metro's contractors to make way for a new world-class transport system. Demolition can produce respirable crystalline silica (RCS) as numerous building materials such as concrete and tiles contain quartz. Demolition workers may be exposed to RCS at quantities that could result in occupational lung diseases, such as silicosis, if the risk is not adequately controlled.

Sydney Metro identified an opportunity to better understand and positively influence the control of exposures to RCS during demolition. As part of this initiative, specific contractual requirements were incorporated on the management of health risks which included RCS. This case study presents a summary of information obtained to support the management of RCS on future projects.

Health risks in demolition

The Code of Practice for demolition work explains that health risks include exposure to asbestos, lead, polychlorinated biphenyls (PCBs) and synthetic mineral fibres. Another key health risk in demolition

includes exposure to RCS, which is generated when products that contain quartz are broken up, sawcut or hammered into, or otherwise turned into dust. As numerous building materials contain quartz, demolition activities that involve these tasks, in addition to waste management, sweeping or cleaning, can result in exposures to RCS. Breathing in RCS can cause incurable diseases such as silicosis and lung cancer.

Demolition work groups at risk of exposure to RCS, ranked starting from the highest risk, include:

- demolition labourers involved in soft "strip-out"
- workers performing structural demolition while operating heavy plant. The risk of exposure can be more than eight times higher if the piece of heavy plant did not have an enclosed cabin with windows and doors that are able to be kept shut
- workers dismantling scaffolding
- general labourers
- workers performing soft "strip-out" while operating heavy plant
- spotters
- workers performing "load-out" activities while operating heavy plant
- cleaners
- supervisors.

On average, the amount of quartz in the dust found on demolition sites was around seven per cent. Although this might appear to be low, exposure to RCS to all of the above listed work groups were assessed as being above the revised Workplace Exposure Standard. Therefore the use of respiratory protection was required to supplement other control measures to protect workers from exposure to RCS.

Controlling RCS during demolition

Some control measures are known to be more effective and reliable than others. These control measures can be ranked from the highest level of protection and reliability through to the lowest level. This is known as the hierarchy of control.

As there were many sources of RCS exposure during demolition, there were also many different control measures that were put in place to protect worker health. This section provides an overview of the control measures that were put in place to mitigate RCS exposure in order of the hierarchy of control.

Substitution controls

Hand-held saws used for cutting are known to produce RCS in close proximity to workers. Larger self-supporting saws were used where practicable to minimise the need for hand-held saws.

Engineering controls

Water was used to suppress RCS in the following ways:

- directly fed to hand-held saw cutting machinery
- in a misting system fixed in the load out area to control dust from the drop zone, in addition to dust that can be generated from vehicle movements over pavements and the loading of trucks
- wetting material down prior to demolition
- wetting down areas with frequent vehicle traffic. Cleaning load out areas using a vacuum truck or hosed into a wedge pit for later removal as waste.

Ventilation was used in the following ways:

- dust extraction fitted to concrete/masonry cutting and coring equipment
- increasing natural ventilation for work areas on live floors by creating exposed areas.

Workers were segregated from dust through:

- covering chutes into which debris was loaded
- screening off areas to prevent the spread of dust
- covering skip bins.



Misting cannon in use to control dust generation during load out of masonry waste.



Demolition at Martin Place North, Hunter Street.

Administrative controls

Many administrative controls were put in place including:

- exclusion zones being set up around live structural demolition activities, with areas enclosed by sheeting and screening to control the spread of dust
- keeping heavy plant cabin doors and windows closed when demolition was in progress or operation
- power tools were required to be inspected daily prior to use to ensure dust controls were operational
- providing awareness training on RCS including the control measures required and the correct use of PPE such as respiratory protection
- performing crystalline silica baseline health monitoring for all work groups assessed to be at significant risk to health due to exposure to RCS
- all workers who used respiratory protection that relied on a seal around the face were required to be clean shaven and facial fit tested
- all levels of supervision and management, by personal example were required to enforce the use of respiratory protection where needed.

Personal Protective Equipment (PPE) Controls

Workers who conducted activities that generated dust, or where otherwise signposted, were required to wear Class P1 (as a minimum) respiratory protection, however most workers wore Class P2 respiratory protection.

Prohibited tasks

The following activities were prohibited onsite:

- workers using hoses for suppressing dust in air near heavy machinery. Also known as “spotters on hoses”, this task required workers to be located close to heavy plant, creating a safety risk, in addition to being put at significant risk to health from RCS exposure. This should not be confused with the need to use water to dampen materials down prior to demolition or during the load out of waste
- dry brush sweeping. Instead, HEPA vacuums or wet methods were used
- prohibition of using compressed air to clean or “dust down” items such as air conditioning filters
- smoking on site.



Demolition and excavation at Martin Place.

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Exposure monitoring

A program of monthly personal exposure monitoring was put in place to measure the levels of RCS to workers. Each month an occupational hygienist performed this monitoring to determine how effective the above control measures were at reducing exposure and to make recommendations on further controls as required.

Work groups that were routinely assessed included those that undertook the following activities:

- scaffolding
- soft strip-out
- structural demolition
- general labourers
- supervisors and support workers
- propping and protection
- traffic control.

Key learnings

Over a two-year period through to 2019, the following key learnings were made with regards to RCS exposures in demolition:

- engaging occupational hygienists to perform air monitoring, verify control measures, and recommend improvements where necessary helped Contractors reduce exposures to RCS
- although the percentage of quartz in dust was relatively low (at seven per cent) the level of exposure to demolition workers was still assessed to be above the Workplace Exposure Standard
- many control measures were needed to reduce exposures to RCS. Some of those control measures were new to industry, including the use of misting systems and dust extraction
- the ongoing use of respiratory protection was challenging in some cases and therefore a greater focus on higher order controls (such as engineering controls) is needed
- many workers had not previously undertaken health monitoring for RCS
- the risk of exposure to practical control measures and RCS should continue to be included in risk assessments for demolition workers going forward.

This case study provides a summary of key information from a paper presented at the Australian Institute of Occupational Hygienists Annual Conference and Exhibition 2019¹.

¹Cole & Fisher 2019, “Controlling exposure to respirable crystalline silica in Sydney demolition workers: A client-led intervention” Australian Institute of Occupational Hygienists 37th Annual Conference & Exhibition, Perth