BREATHE FREELY IRELAND

Controlling exposures to prevent occupational lung disease in CONSTRUCTION

Concrete Sprayer

HAZARDS AND RISKS

During tunnelling works, sprayed concrete lining (SCL) is applied to the surfaces of the tunnel to provide reinforcement of the excavated area, and is usually repeated a number of times to apply various layers (such as waterproofing), typically using a robotic spraying rig. This process can generate a large quantity of airborne dust which, if inhaled, exposes workers to respiratory health risks. The highest risk to a concrete sprayer's health is likely to be from breathing in dust, and in particular, silica dust.

Construction dust

Construction dust is a general term and includes dust from soil and building materials. Breathing in any dust over time can cause serious lung diseases such as chronic obstructive pulmonary disease (COPD) which is an umbrella term for a number of conditions including chronic bronchitis and emphysema.

Respirable Crystalline Silica (RCS)

Silica occurs as a component of concrete and is often present in the consumable materials used during concrete spraying. Inhaling fine silica dust (RCS) over time can lead to serious, life-limiting and irreversible lung diseases such as silicosis, COPD, and lung cancer; these diseases can cause permanent disability and early death. The WHO* and the ILO* estimate that approximately 30 people die annually in Ireland from occupational exposure to respirable crystalline silica (RCS).

The WHO is the World Health Organisation, and the ILO is the International Labour Organisation. They are both United Nations agencies.

CONTROL OPTIONS

Elimination/prevention

- Preventing exposure to silica is the most effective control measure of all. It may be possible that silica can be eliminated or greatly reduced by using non-silica or low silica materials for spraying.

Engineering controls

- As concrete spraying is often undertaken in tunnels, it can be difficult to implement local exhaust ventilation (LEV) controls.
- Use of de-duster units (air scrubbers positioned directly behind the work area) can reduce exposures.
- Dilution ventilation – forced provision of fresh air to the spraying face to dilute any dust generated – should also be considered in any enclosed environments.

Safe working methods

- Access to areas where spraying is undertaken must be strictly controlled (using physical barriers) and signage used to highlight the necessary controls.
- In most cases it is possible to control exposure to RCS by using a wet mixture that reduces the amount of airborne dust generated; this "wet" method, where additional water is mixed with the concrete before being sprayed, has generally replaced the older industry methods of concrete application.

PPE

- Engineering control techniques may not always be suitable for the task, so respiratory protective equipment (RPE) may be necessary.
- Due to the elevated levels of inhalable dust typically generated, sprayer operatives working alongside the spraying rig will require the use of battery powered respirators with P3 filters (with an APF protection rating of 40).
- Workers in the general vicinity will also need RPE; based on typical dust levels experienced in these areas RPE with an APF protection rating of 20 will usually be sufficient, disposable dust masks (FFP3 rated) will meet this requirement.

MANAGING THE RISK

Training & Communication

Supervision, maintenance & testing of controls and air monitoring are all vital aspects of managing the risk, in addition to health surveillance which can be a requirement in certain circumstances.

Air monitoring

Air monitoring is a specialist activity. It may be needed as part of a chemical risk assessment, as a periodic check on control effectiveness and to assess compliance with relevant OELVs, or where there has been a failure in a control (for example if a worker reports respiratory symptoms). A qualified Occupational Hygienist can ensure it is carried out in a way that provides meaningful and helpful results.

To obtain the most accurate and up-to-date information, it is recommended to visit the Health and Safety Authority (HSA) website or contact the HSA directly. The website may have the latest versions of the relevant code of practice, guidelines, and regulations.

https://www.hsa.ie

See reverse for Occupational Exposure Limit Values (OELVs)

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OCCUPATIONAL EXPOSURE LIMIT VALUES (OELVs) & EXPOSURE LEVELS

Agent or substance	Control/Exposure Limit	Exposure Levels	Comments
Silica - RCS	Respirable: 0.1 mg/m^3 (8-hr reference period)	Exposure to RCS is dependent on the silica content of the material being worked, which varies; the silica content of concrete is typically quite high, at anything from 25 - 75%. Even with basic controls in place, likely exposure to total inhalable dust may be above the OELV (sometimes two or three times the limit), and this may also be true for RCS during uncontrolled spraying. Different types of stone contain different amounts of silica, with sandstone (70 - 90% silica) and concrete (anything from 25 - 75% silica) typically containing the most, with granite, slate and brick at around 30% and limestone and marble 2% silica. All dust exposure levels are affected by the frequency and duration of the work and are likely to be higher in poorly ventilated spaces. Dry working without extraction control is likely to produce the highest levels of dust. Levels of exposure to all airborne dusts are affected by the frequency and duration of the work being undertaken and are likely to be higher in poorly ventilated spaces/areas.	Capable of causing cancer where generated as a result of a work process.

Further information

Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 to 2021

Safety, Health and Welfare at Work (Carcinogens, Mutagens and Reprotoxic substances) Regulations 2024

Current Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations, 2001 as amended and the Safety, Health and Welfare at Work (Carcinogens, Mutagens and Reprotoxic substances) Regulations 2024.

HSA guidance on diesel engine exhaust

Control of Chemical Agents: Your Steps to chemical safety. A guide for small business. Guidelines on Occupational Asthma - Health and Safety Authority (hsa.ie)

Guidelines on Occupational Dermatitis - Health and Safety Authority (hsa.ie)