



Silica Dust: Risks when working with Engineered Stone

Silica and Engineered Stone

Silica is a natural substance found in most rocks, sand and clay and in products such as bricks and concrete.

Silica is also found in engineered stone. Engineered stone is a man-made composite material that is made by mixing crushed stone with a resin binder.

When processing stone containing crystalline silica, dust containing respirable crystalline silica (RCS) is released into the air. RCS can cause diseases such as silicosis in exposed workers.

As crystalline silica content varies considerably in both engineered stone and natural stone, working with the higher silica content stone should be avoided.



NO RCS, NO SILICOSIS

What are the health effects?

Exposure to RCS dust can lead to the development of:

- Silicosis (an irreversible scarring and stiffening of the lungs), the form of which (acute, accelerated, chronic) relates to level and duration of exposure
- Chronic Obstructive Pulmonary Disease (COPD)
- Lung cancer
- Kidney disease
- Auto-immune diseases such as rheumatoid arthritis

To detect early signs of silicosis and COPD due to RCS exposure, managers need to take appropriate action and carry out health surveillance. Dermatitis can occur due to dust exposure and/or wet working and PPE use, requiring skin health surveillance.

Cases of silicosis in those working with engineered stone have been reported in Great Britain.

Sources of Exposure

By law, every worker should be given suitable and sufficient information, instruction and training when dealing with hazardous substances. RCS exposures can occur when processing engineered stone such as cutting, grinding, drilling and polishing during the fabrication and installation of stone worktops.

Fabrication

Fabrication workers on fixed stone working premises may be at higher risk compared to installers because they carry out activities that can produce RCS dust for most of their shift. However, there should be effective controls in place to minimise their exposure in line with the Control of Substances Hazardous to Health (COSHH) regulations.

Installation

Installers still need to follow good work practices by minimising any stone processing they need to do on-site, and by using appropriate controls if minor onsite processing is necessary e.g. on-tool extraction/water suppression, good ventilation and RPE.

Where no processing occurs at the installation stage, it is unlikely that RCS will be released.

Control Measures

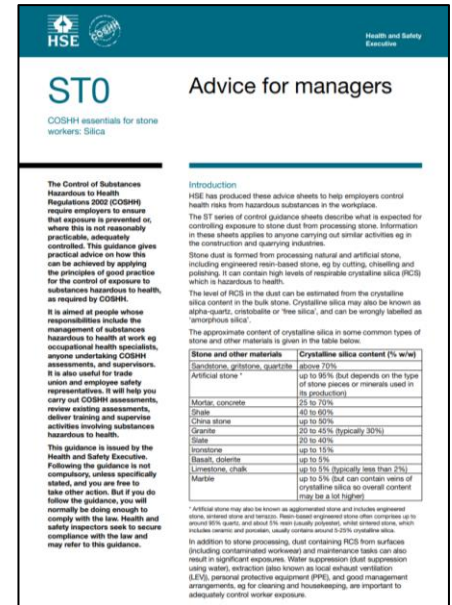
Dry cutting, grinding, drilling or polishing stone generates very high levels of dust containing RCS.

Uncontrolled dry processing is a high risk. Dust control measures must be in place.

These tasks require a range of control measures which can protect workers from exposure to respirable crystalline silica including;

- The use of lower silica content material
- Separating the worker from the task
- Equipment enclosure
- Water suppression
- Extraction
- Personal protective equipment (PPE), such as respirator masks.

Remember, PPE alone cannot protect the workers.



STO
COSH essentials for stone workers: Silica

Advice for managers

Introduction
HSE has produced these advice sheets to help employers control health risks from hazardous substances in the workplace. The ST series of control guidance sheets describe what is expected for controlling exposure to stone dust from processing stone. Information in these sheets applies to anyone carrying out similar activities eg in the construction and quarrying industries. Stone dust is formed from processing natural and artificial stone, including engineered near-based stone, eg by cutting, chiselling and polishing. It can contain high levels of respirable crystalline silica (RCS) which is hazardous to health. The level of RCS in the dust can be estimated from the crystalline silica content in the bulk stone. Crystalline silica may also be known as alpha-quartz, cristobalite or 'free silica', and can be wrongly labelled as 'amorphous silica'.

The approximate content of crystalline silica in some common types of stone and other materials is given in the table below.

Stone and other materials	Crystalline silica content (% w/w)
Sandstone, gabbros, quartzite	above 75%
Artificial stone*	up to 95% (but depends on the type of stone pieces or minerals used in its production)
Mortar, concrete	25 to 20%
Graite	40 to 60%
China stone	up to 50%
Granite	20 to 45% (typically 30%)
Slate	20 to 40%
Travertine	up to 15%
Basalt, dolomite	up to 5%
Limestone, chalk	up to 5% (typically less than 2%)
Marble	up to 5% (but can contain veins of crystalline silica so overall content may be a lot higher)

*Artificial stone may also be known as agglomerated stone and includes engineered stone, sintered stone and terrazzo. Near-based engineered stone often comprises up to around 85% quartz, and around 15% non-silica minerals, unless sintered stone, which includes diamonds and graphite, other minerals and around 0.5% crystalline silica. In addition to stone processing, dust containing RCS from surfaces (including contaminated workwear) and maintenance tasks can also result in significant exposure. Water suppression (dust suppression using water), extraction (also known as local exhaust ventilation (LEV)), personal protective equipment (PPE), and good management arrangements, eg for cleaning and housekeeping, are important to adequately control worker exposure.

Control Measures: Water Suppression (1)

- Use tools and machinery that have been specifically designed for use with water attachments.
- Use bridge saws fitted with water attachments to suppress dust when cutting slabs.
- Use water suppressed routers, water jet cutters or bridge saws to complete sink cut outs.
- Use hand-held angle grinders fitted with multiple water feeds to deliver water to the cutting disc and point of contact with the stone.
- Use water suppressed wet-edge milling machines or polishing machines.
- Use handheld polishers with a centre water feed to polish stone.
- Beware when using water around power supplies and other electrical equipment.

Control Measures: Water Suppression (2)

- Make sure there are enough water feeds directed at the material and/or tool to prevent visible dust during the process.
- Maintain appropriate water pressure to make sure sufficient water is reaching the material and/or tool for the duration of the task.
- Control water spray from water suppressed tools and machinery using guards, plastic flaps, baffles or brush guards.
- Prevent workers from being able to turn water suppression systems down or off during operation.
- Ensure water used for dust suppression is clean. Recycled water should be treated before re-use.
- Recirculated water needs a programme of regular checks and maintenance to prevent the growth of bacteria, including Legionella.

Control Measures: Local Exhaust Ventilation (LEV)

- If water suppression is not reasonably practicable then use local exhaust ventilation (LEV) / extraction.
- Where processes can be automated, enclose the process and provide extraction to remove the airborne dust generated.
- For powered hand-held tools (for example drills, circular saws, grinders), work within a partial booth that has extraction and ensure the worker's position does not obstruct the air flow. The booth can have either a dry or wet (water wall) extraction system and all exhaust air should be ducted externally unless it can be 'thoroughly cleaned'.
- When working from multiple locations, use powered hand-held tools with on-tool dust extraction, which typically consists of a shroud and a suction attachment point connected to a dust class M or H rated vacuum. Select tools that have been specifically designed for LEV attachments – retrofitting extraction on to old tooling can be a challenge.
- Cordless tools with internal dust bags and flexible capturing hoods may have limited use as they can be overwhelmed by the volume and velocity of dust generated.

Work Practices

- Enclose the process so far as reasonably practicable to isolate workers from dust generating processes.
- Provide distance between the work process and the worker (for example operators positioning when using bridge saws or routers).
- Provide distance between workers using powered hand tools and other workers at the workplace.
- Provide physical barriers between different workers and workstations to prevent the water mist/dust moving into other work areas or towards other workers.
- Capture all water generated from water-suppressed processes through curbing and channelling.
- Clean surfaces post-processing to remove residual dust/spray before moving the slabs.
- Prevent water pooling and drying on surfaces leaving dry dust deposits which can become airborne.
- Wash hands and face thoroughly before eating, drinking, smoking or leaving the workplace.
- Launder dusty or contaminated work clothes at the workplace or use a commercial laundry to avoid taking them home.

Cleaning and Housekeeping

- Do not use dry sweeping or compressed air to clean surfaces or clothing.
- Implement daily and thorough housekeeping and cleaning procedures for water slurry and settled dust.
- Clean the walls, floors and other surfaces with low-pressure water or wet sweeping. If dry dust cleaning is necessary use an M class rated vacuum cleaner.
- Regularly clean vehicles used to transfer the materials.
- Use suitable RPE with an assigned protection factor (APF) of at least 20 for cleaning.
- Do discard all stone waste materials (wet slurry & captured dust) in a safe manner. E.g. Place wet slurry in a container, bag or bin with a lid for disposal.

Personal Protective Equipment (PPE)

- If using water suppression provide workers with waterproof boots or wellingtons, waterproof jackets or aprons to protect from water splashes and prevent contamination of clothing.
- Decontaminate clothing by removing dry dust using wet wipes or M class vacuum cleaner, before leaving processing area. Workers should not remove their respiratory protective equipment (RPE) until after this is done, and the rest of their PPE has been safely removed.
- After each shift, workers should change their clothing that has been contaminated with silica dust. Contaminated PPE or workwear should not be re-used on the next work shift as it can be a significant source of RCS exposure.
- Launder dusty or contaminated work clothes at the workplace or use a commercial laundry to avoid taking them home. Inform laundry that clothes are contaminated with RCS dust.

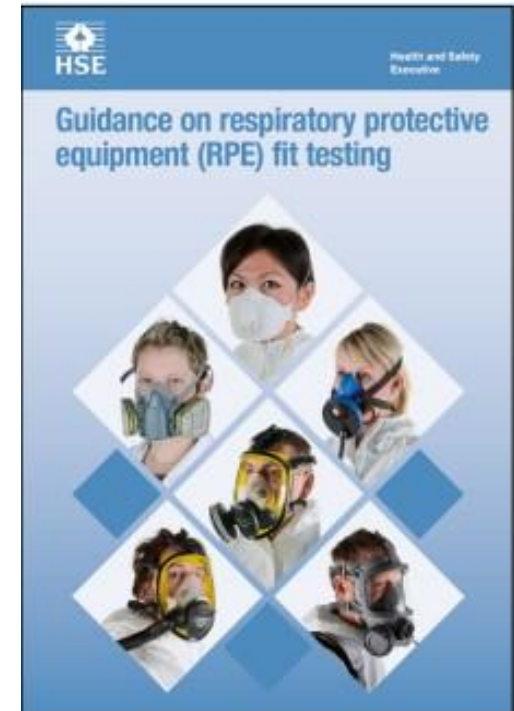
Respiratory Protective Equipment (RPE)

- Suitable RPE with an assigned protection factor (APF) of at least 20 to provide the appropriate level of protection must be worn.
- Make sure that the respirator meets the required legal performance standards and carries a UKCA or CE marking and is not a cheap copy.
- Unpowered tight-fitting masks become uncomfortable to wear for long periods and wearers may be tempted to loosen or remove the RPE.
- If the RPE needs to be worn for more than 1 hour, fatigue and discomfort can be minimised by: using Powered Air Purifying Respirators (PAPR) with tight-fitting masks, or loose-fitting facepieces (e.g. powered hood/helmet).
- Tightfitting PAPR must be face fit tested, while loose fitting PAPR can be worn by workers without the wearer being clean shaven.



Fit-testing of Respirators

- Fit testing is a method for checking that a specific model and size of tight-fitting RPE matches the wearer's facial features and seals adequately to the wearer's face. It will also help to identify unsuitable facepieces which should not be used.
- Workers need to pass a fit-test before they start wearing a tight-fitting respirator.
- Workers must be clean-shaven or only have facial hair that doesn't cross the respirator sealing surface or interfere with the valve whenever they wear a tight-fitting facepiece at work.
- Facial hair can stop a tight-fitting respirator from sealing correctly and protecting the wearer.
- Fit testing should be conducted by a competent person. Competence can be demonstrated by accreditation under the Fit2Fit RPE Fit Test Providers Accreditation Scheme.



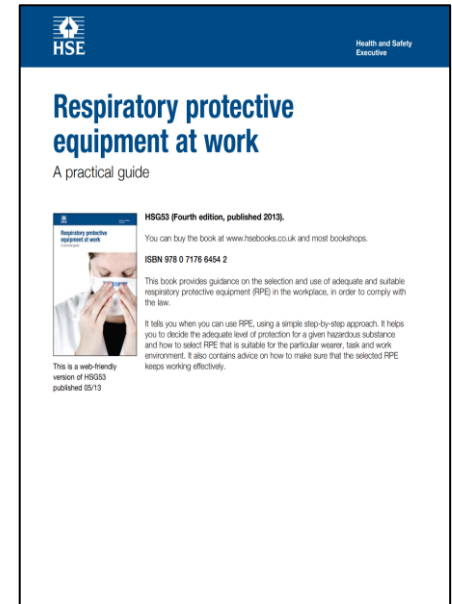
Respiratory Protective Equipment: Training

When issuing RPE, training is required to ensure that workers correctly use and maintain RPE.

Training must be provided by a competent person, and cover the following topics:

- Why and when RPE is required
- How RPE works and its limitations
- How to correctly put on and take off RPE
- How to check RPE is working properly before every use
- How to clean and maintain RPE - For reusable RPE, a thorough maintenance, examination and test should be carried out at least once a month
- When and how to replace filters
- How and where to store RPE when not in use

Workers need to be clean shaven when wearing tight-fitting respirators.



Training your workers

By law, workers must be trained so that they understand:

- The health hazards of RCS and their workplace risk assessment
- How to use and maintain the dust controls, and what to do when there is a fault with these systems
- How to wear and maintain PPE/ RPE
- Procedures for housekeeping and washing overalls
- Procedures for cleaning-up with water and vacuum cleaners
- Health surveillance system and procedures
- The results of any air monitoring procedures
- Arrangements to deal with any accidents, incidents or emergencies

Air Monitoring

- Air monitoring can be used to check on respirable silica dust levels and the effectiveness of the controls and work practices.
- Monitoring should be performed by a competent occupational hygienist. A listing can be found at :[Register of Occupational Hygiene Professionals - British Occupational Hygiene Society \(BOHS\)](#)
- Air monitoring RCS should be carried out using validated methods e.g. MDHS 14/4 and MDHS 101/2.
- Air monitoring results must be provided to the workers and made available for medical staff performing health surveillance.



Health Surveillance

To detect early signs of silicosis, COPD and dermatitis and take appropriate action, you should carry out health surveillance.

Early signs of these diseases may indicate that you are not adequately controlling exposure, which requires further action to protect the affected worker and their colleagues.

You will need to take advice from a competent occupational health professional (doctor or nurse) when setting up and implementing a health surveillance programme.

You will also need to create a health record, which includes each workers fitness to work, any actions required, and timing of next health surveillance.



Summary of RCS risk management for installers

- Eliminate on-site processing as much as possible – use accurate measurements prior to fabrication and cut out sink & tap holes in the workshop
- Identify those tasks which may need to be done on-site and the controls required
- Ensure all the necessary controls are available (eg water suppression or on-tool dust extraction and appropriate RPE) and that workers know how to correctly use them and report faults. If tight-fitting RPE is used it must be fit tested.
- Carry out any minor modifications in a well-ventilated, segregated area (preferably outdoors) using the appropriate controls (for major modifications return the stone to the workshop)
- Clean up after the installation using wet methods or vacuum (at least dust class M). clean surfaces, tools and workwear.

Summary of RCS risk management for fabrication (1)

- When possible, work with stone containing a lower crystalline silica content.
- Identify all tasks where workers could be exposed to RCS and the control measures required (for guidance see HSE COSHH Essentials ST series). Ensure workers understand the need for, and how to use, the controls.
- Prevent worker exposure by the enclosing the process so far as practicable.
- Use water suppression to control dust at source (when safe to do so) – ensure water supply is adequate and kept clean to prevent microbial growth eg Legionella. Prevent exposure to any mist.
- If necessary to process stone dry – carry out work in an extracted booth and duct the exhaust air externally (unless it can be thoroughly cleaned). Ensure worker position does not obstruct air flow.

Summary of RCS risk management for fabrication (2)

- In addition, provide workers with appropriate RPE – ensure they know how to correctly use, clean, store and maintain it. Loose fitting PAPRs do not need fit testing, can be used for more than 1 hour continuously and are suitable for those with facial hair.
- Prevent the spread of dust/mist e.g. dampen slab surfaces to remove dust before moving them, segregate work areas, get contaminated coveralls cleaned. Undertake regular workplace cleaning using wet methods or vacuum (at least dust class M).
- Ensure all controls are regularly checked and maintained, and that workers know how to use them and report faults. The effectiveness of controls can be assessed by air monitoring.
- Have health surveillance carried out at appropriate intervals (normally annually), for workers processing engineered stone, as there is a 'reasonable likelihood' of developing disease due to silica dust exposure.

References

1. [Control of substances hazardous to health \(COSHH\). The Control of Substances Hazardous to Health Regulations 2002 \(as amended\). Approved Code of Practice and guidance L5 \(hse.gov.uk\)](#)
2. [Control of exposure to silica dust: A guide for employees \(hse.gov.uk\)](#)
3. [HSG53: Respiratory protective equipment at work: A practical guide \(hse.gov.uk\)](#)
4. [COSHH essentials for stonemasons: Silica \(hse.gov.uk\)](#)
5. [G404 - Health surveillance for those exposed to respirable crystalline silica \(RCS\) \(PDF\)](#)
6. [G403 - Health surveillance for occupational dermatitis \(PDF\)](#)
7. [Health surveillance for those exposed to respirable crystalline silica \(RCS\): Supplementary guidance for occupational health professionals \(hse.gov.uk\)](#)
8. [L8: Legionnaires' disease. The control of legionella bacteria in water systems \(hse.gov.uk\)](#)
9. [HSG258: Controlling airborne contaminants at work: A guide to local exhaust ventilation \(LEV\) \(hse.gov.uk\)](#)
10. [HSG201: Controlling exposure to stone dust - Publications – HSE](#)
11. [Construction hazardous substances: Construction dust \(hse.gov.uk\)](#)
12. [Guidance on respiratory protective equipment \(RPE\) fit testing \(hse.gov.uk\)](#)