

# HOW TO REDUCE EXPOSURE TO RESPIRABLE CRYSTALLINE SILICA



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Did you know that a paving vehicle releases 45 million mcg of dust into the air? Silica is a natural substance found in most rocks and in products such as bricks and concrete. These materials create dust when they are cut, sanded or carved. The dust is called respirable crystalline silica (RCS) and is too fine to see with normal lighting. Occupational exposure to RCS is a major cause of lung disease, including silicosis, chronic obstructive pulmonary disease (COPD) and lung cancer.<sup>1</sup>

Roughly half a million people are exposed to silica dust at work in the UK, and about 5 million in the European Union. The majority of these people are in the construction sector, such as those working as bricklayers, stonecutters, stonemasons and demolition workers (more than 80 percent). A large study in Europe and Canada suggests that exposure in the UK is higher than elsewhere in Europe, though it has steadily been declining by 6 percent each year due to improved technology.<sup>2</sup>

The silica content in common building materials and rail ballast can be significant. Typical estimates are:

- Sandstone (70-90%)
- Concrete and mortar (25-70%)
- Tile (30-45%)
- Granite ballast (20-45%)
- Brick (up to 30%)<sup>3</sup>

**Approximately 900 new cases of lung cancer each year in Britain can be attributed to past exposure to silica dust and nearly 800 people die per year from lung cancer caused by silica exposure.<sup>4</sup>**

## Measuring RCS and optimal control measures

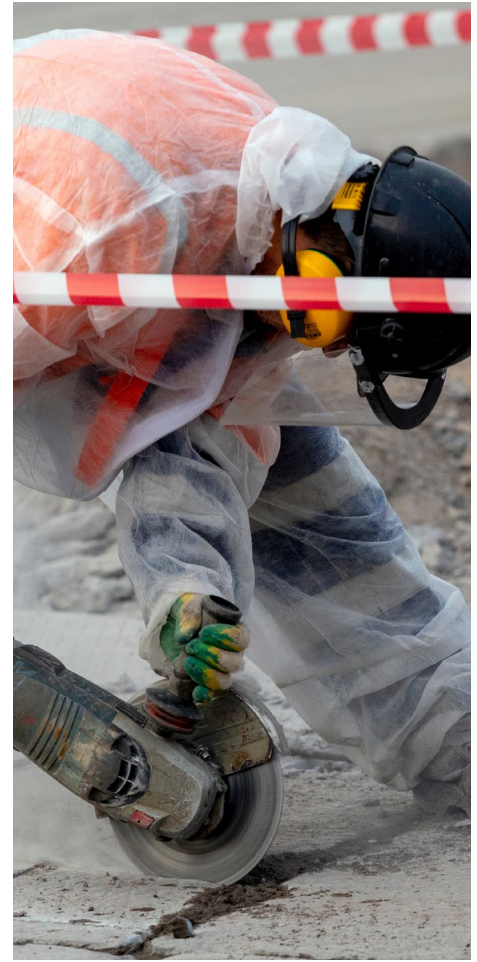
Since RCS is a substance hazardous to health under The Control of Substances Hazardous to Health Regulations (COSHH), it has a long-term Workplace Exposure Limit (WEL) of 0.1 mg/m<sup>3</sup> per eight-hour time period.

In the UK, employers must comply with COSHH's 2002 guidance on this topic, which requires:

- Assessing the risks to workers health;
- Considering, where practicable, substituting material with a lower RCS content;
- Preventing or controlling exposures to RCS by:
- Following good occupational hygiene practice to achieve adequate control of exposure

Control measures must be effective in keeping exposure below the WEL of 0.1 mg/m<sup>3</sup> respirable dust averaged over eight hours. Every employer must ensure that the exposure of their employees to substances hazardous to health is either prevented or, where this is not reasonably practicable, adequately controlled.

If exposure to respirable silica cannot be eliminated, the first step is to monitor or assess the exposure and identify the jobs and tasks that need better controls. Employers must not carry out work until a suitable and sufficient assessment of the risks to employees' health created by that work has been carried out and the steps needed to comply with the COSHH Regulations have been identified and put into operation.<sup>5</sup>



Ideally, silica-containing materials should be replaced, whenever possible. Work processes should be isolated and proper ventilation should be provided. If this is not possible, engineering controls need to be set up. A range of options are available to control exposure to silica dust at work, including:

- Engineering controls like enclosures or hoods and local exhaust ventilation (LEV) to extract the contaminated air at the point it is produced, or to use water suppression on fixed machinery.
- Localized ventilation on the tool or suppress the dust using water spray systems.
- The U.S. National Institute for Occupational Safety and Health (NIOSH) tested a water spray to suppress dust created during concrete pavement breaking. This solution reduced dust exposure by 70% to 90%. Other tools include shrouds and dust collections systems, such as vacuums with self-cleaning HEPA filters.



## Respirator selection guidance

When these measures prove inefficient, it is not possible to adequately control airborne silica dust using engineering solutions and air sampling data shows that there is still an unacceptable level of dust, respiratory personal protective equipment (RPE) becomes mandatory.

Protection from RCS takes the form of a filtering facepiece or a reusable facepiece with filters, based on the level of dust concentration. Tight-fitting RPE should be face fit-tested for the individual, with written records kept, and workers should be clean-shaven. UK Health and Safety Executive (HSE) research suggests that shaving within the eight hours prior to a work shift is a good practice.

For those who have a beard for religious reasons, or if an adequate face fit cannot be achieved (e.g., due to facial shape or scarring), loose-fitting RPE such as a powered hood or helmet may be needed. Where workers need to wear RPE continuously for more than one hour, use of a powered respirator will be needed rather than tight fitting disposable types, as the face seal may not be reliable after prolonged use.<sup>6</sup>

When selecting a respirator, providing sufficient reduction in exposure to protect the worker's health is vital. Respirators are given an assigned protection factor (APF) rating that indicates the minimum reduction in exposure achieved. There are three types of filtering facepiece respirators in the EN 149 standard, ranging from FFP1 to FFP3. The highest level is recommended (FFP3) to provide the greatest level of protection: an APF 20 device, for example, cuts the wearer's exposure to airborne particles by a factor of 20. Examples of activities requiring a FFP3 include:

- **Kerb-cutting** – HSE recommends a mask with an assigned protection factor of 20, such as a FFP3 disposable mask or half mask with a P3 filter
- **Using hand-held rotary tools for cutting and polishing** – HSE recommends respiratory protective equipment with an APF of at least 40 (a full-face mask with a particle filter if worn for less than an hour, or a powered mask or powered hood/helmet if worn for more than an hour)<sup>7</sup>

It is important to note that respiratory equipment should be the last resort, and used in conjunction with other controls, rather than the default option.

## Preventing RCS health hazards

Prevention is always the best medicine. Worker health surveillance is important to prevent or detect silicosis or other silica-related diseases. Analyzing past exposure and latency should be part of this process. Where eliminating or substituting respirable silica is not reasonably practicable, adequate control should be achieved using the hierarchy of control measures specified in COSHH regulation 7(3).

Training is also critical to increasing awareness of silica dust sources. All RPE should be checked before each use and be subject to thorough maintenance, examination and testing at least once a month, with written records (with the exception of single-use, disposable types). Housekeeping plays a crucial role in keeping health hazards at bay. Make sure spills are cleaned up fast, debris is always removed from equipment, waste is handled correctly and storage areas are ventilated.

To learn more about how to control silica dust, browse [HSE's](#) resources, and explore Honeywell's RPE options [here](#).

### Sources:

1. <https://www.hse.gov.uk/pubns/cis36.pdf> Health and Safety Executive, Construction Dust
2. [Silica-the-Facts.pdf](#) Institution of Occupational Safety and Health
3. [rig-2017-01-respirable-crystalline-silica-in-the-rail-industry.pdf](#) Office of Rail and Road, RIG-2017-01, RESPIRABLE CRYSTALLINE SILICA IN THE RAIL SECTOR
4. [Silica-the-Facts.pdf](#) Institution of Occupational Safety and Health
5. <https://www.hse.gov.uk/pubns/priced/l15.pdf> Regulation 6, Health and Safety Executive, control of substances hazardous to health
6. [rig-2017-01-respirable-crystalline-silica-in-the-rail-industry.pdf](#) Office of Rail and Road, RIG-2017-01, RESPIRABLE CRYSTALLINE SILICA IN THE RAIL SECTOR
7. [Silica-the-Facts.pdf](#) Institution of Occupational Safety and Health

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