Silica

Construction Information Sheet No 36 Revision 1

Introduction

Silica occurs as a natural component of many materials used or encountered in construction activities. This information sheet deals with crystalline silica which can cause lung disease.

Crystalline silica is present in substantial quantities in sand, sandstone and granite, and often forms a significant proportion of clay, shale and slate. It can also be found in chalk, limestone and other rock and soil, though this is unusual. Products such as concrete and mortar also contain crystalline silica.

Exposure to silica

The health hazards of silica come from breathing in the dust. Activities which can expose workers or members of the public to the dust include:

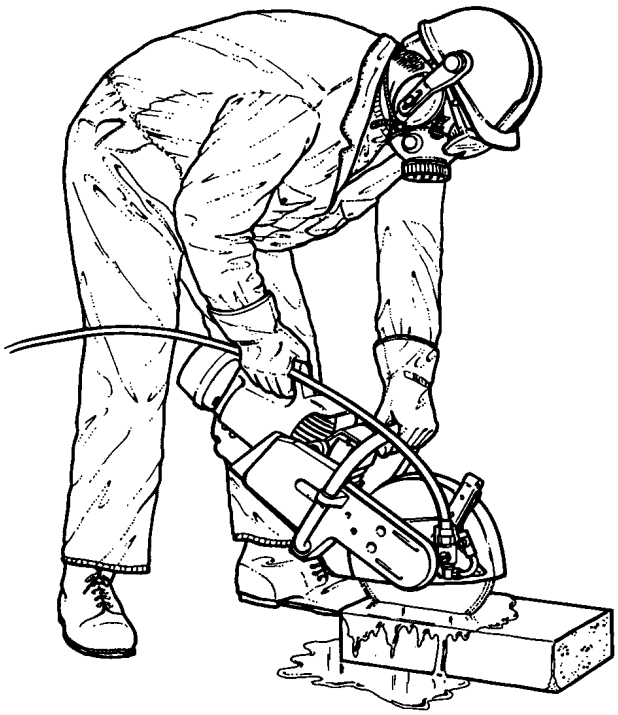
- stone masonry;
- facade renovation;
- blast cleaning of buildings, especially using sand;
- many demolition processes;
- concrete scabbling, cutting or drilling;
- tunnelling.

The use of power tools to cut or dress stone will lead to high exposures throughout the work. For other activities, exposure will often depend upon how confined the working space is, the presence or absence of ventilation and how near the worker's breathing zone is to the source of the dust. Tunnelling through dry, silica-bearing rock will always lead to high exposures for workers at or near the cutting face.

Health effects

Breathing in the very fine dust of crystalline silica can lead to the development of silicosis. This involves scarring of the lung tissue and can lead to breathing difficulties. Exposure to very high concentrations over a relatively short period of time can cause acute silicosis, resulting in rapidly progressive breathlessness and death within a few months of onset. Similarly, accelerated silicosis, which can progress to death within a decade, has been associated with high exposures to silica in sand blasting.

More common is progressive silicosis, usually because of exposure over a longer period. This causes fibrosis (hardening or scarring) of the lung tissue with a consequent loss of lung function. Victims are likely to suffer severe shortness of breath and will find it difficult



or impossible to walk even short distances or upstairs. The effect continues to develop after exposure has stopped and is irreversible. Sufferers usually become house- or bed-bound and often die prematurely due to heart failure.

Silica may be linked to lung cancer. If this is the case it is most likely that it occurs as a progression of lung fibrosis. Precautions taken to control the risk of fibrosis will serve to control the risk of lung cancer.

Legal requirements

Silica has been assigned a maximum exposure limit (MEL) of 0.3 mg/m^3, expressed as an 8-hour time weighted average (TWA). This means that exposure to respirable crystalline silica should be reduced so far as is reasonably practicable and, in any case, below the MEL.

Precautions

Assessment

Activities which may expose workers to silica are subject to the Control of Substances Hazardous to Health Regulations 2002 (COSHH) which require the health risk to be assessed and then prevented or controlled. In most cases, when it is reasonable to expect dust levels to be significant, you should consider the need for atmospheric sampling of respirable dust and respirable silica.

As a general rule, levels greater than 0.1 mg/m^3 can be regarded as significant. In cases of doubt it should usually be assumed that levels will be significant unless sampling from very similar work has shown otherwise. Results of sampling may be needed to find out the control measures that will be appropriate for a particular activity. As well as evaluating the risk and describing the precautions, the assessment should set out in detail the way in which the control measures are to be monitored, supervised and maintained.

Prevention and control

Elimination and substitution

First of all, try to get rid of silica dust from your work. Sometimes silica can be eliminated by substituting other materials, for instance, using non-silica grits for blasting. Those who specify materials have a duty under the Construction (Design and Management) Regulations 1994 (CDM) not to use hazardous materials and processes. Where this is not possible they should specify the least hazardous products which perform to an acceptable standard. It may be possible to get rid of or reduce the need for scabbling, cutting or drilling concrete through design.

Control of dust

If you cannot get rid of silica dust, you should reduce exposure. In most cases it is feasible to control respirable silica by dust suppression techniques or local exhaust ventilation. Exhaust ventilated tools which remove the dust at source, and tools fitted with a water supply for dust suppression, are widely available. Capturing or controlling the dust at source is nearly always better than attempting to control exposure by ventilating the whole area.

Personal protective equipment (PPE)

These control techniques may not always be appropriate or they might not reduce exposure sufficiently, so respiratory protective equipment (RPE) often has to be provided as well. You will need to select RPE very carefully as different types can give widely varying standards of protection. Surveys of respirable dust and respirable silica levels are usually necessary to ensure correct selection. For the dustiest processes, positive pressure or airline breathing apparatus will probably be necessary. Remember that filtering facepiece or half-mask respirators give little or no protection to men with beards and that even a minor growth of stubble can severely reduce the effectiveness of RPE. Guidance on the selection and use of RPE is contained in the HSE booklet: *Respiratory protective equipment: A practical guide* (see References section). Further information can be obtained from RPE manufacturers who should provide information on approval and suitability. Remember that workers need to be properly trained in the use of RPE and that a high standard of supervision, inspection and maintenance will also be needed. Suitable protective clothing should be provided to prevent contamination of worker's own clothing.

Those who need to wear PPE should be trained in its proper use and in its limitations. Store the equipment in clean, dry conditions away from chemicals - a locker would be suitable. PPE should be maintained and kept clean and fit for wear.

Facilities for washing and changing should be available on site and workers should wash their hands before eating, drinking, smoking and going to the toilet. Eating, drinking and smoking should take place away from the work area.

Health surveillance

Where workers are regularly exposed to respirable crystalline silica levels greater than 0.1 mg/m^3, 8-hour TWA, then health surveillance which includes a respiratory questionnaire, lung function testing and chest X-rays should be provided. HSE Guidance Note *Respirable crystalline silica* describes health surveillance requirements in more detail (see References section).

Please see the table on page 3 for examples of typical levels of silica exposure in some common construction activities

Examples of typical levels of silica exposure in some common construction activities

Activity	*Control measures*	*Exposure*	*Improvements required **
Drilling in poorly ventilated undercroft	● no dust suppression ● no extraction ● no forced ventilation ● inadequate respiratory protective equipment (RPE)	**HIGH - 300 times the MEL**	● fit water suppression or dust extraction to drilling equipment ● provide appropriate RPE ● ensure correct use of RPE
Drilling into brickwork under arch blocked at one end	● primitive extraction by fan and airbag ● disposable face masks worn	**HIGH - 5 times the MEL**	● fit water suppression or dust extraction to drilling equipment ● provide appropriate RPE ● ensure correct use of RPE
Using jackhammers to break out concrete in large open indoor area	● limited ventilation ● no dust suppression ● no local exhaust ventilation ● no RPE in use	**MEDIUM - within the MEL but double the level regarded as reasonably practicable**	● wet down concrete and rubble
Chasing out cracks in screeded cement floor in large open indoor area	● RPE provided but not worn properly ● breathing zone of worker crouching over grinder very close to source of dust	**HIGH - 6 times the MEL**	● attach dust extraction to grinder ● wet down ahead of the chasing ● provide appropriate RPE ● ensure correct use of RPE
Chasing out mortar between bricks prior to re-pointing	● ineffective extraction fitted to hand-held electric grinder ● RPE correctly worn but not to correct standard	**HIGH - 21 times the MEL**	● attach dust extraction to grinder ● provide appropriate RPE ● ensure correct use of RPE
Cutting paving kerb (33% silica) in open area	● petrol driven saw not fitted with water spray or local exhaust ventilation	**HIGH - 12 times the MEL**	● provide effective water suppression system to saw
Cutting blue brick (32% silica) in open area	● petrol driven saw not fitted with water spray or local exhaust ventilation	**HIGH - 5 times the MEL**	● provide effective water suppression system to saw
Cutting breeze block (3% silica) in open area	● petrol driven saw not fitted with water spray or local exhaust ventilation	**HIGH - twice the MEL**	● provide effective water suppression to saw
Cutting window openings in concrete wall with wall saw/ Cutting concrete with floor saw	● water suppression on saw used	**LOW - well below the MEL and also below the level regarded as significant**	
General clearing and removing rubble	● hand sweeping with brush	**HIGH - twice the MEL**	● damp down rubble before clearing ● use mechanical means to sweep up ● provide appropriate RPE ● ensure correct use of RPE
General clearing and removing rubble	● use of mechanical sweeper with rotating brushes and vacuum extraction	**MEDIUM - within the MEL but double the level regarded as significant**	● provide appropriate RPE ● ensure correct use of RPE
Concrete crushing from demolition job for use as hard core	● machine with enclosed cab ● water jets fitted	**LOW - well below the MEL and also below the level regarded as significant**	

* To reduce exposure to below the maximum exposure limit (MEL) and so far as is reasonably practicable.

References

Respirable crystalline silica Environmental Hygiene Guidance Note EH59 (Second edition) HSE Books 1997 ISBN 0 7176 1432 8

Respiratory protective equipment: A practical guide HSG53 (Second edition) HSE Books 2004 ISBN 0 7176 2904 X

COSHH a brief guide to the regulations: What you need to know about the Control of Substances Hazardous to Health Regulations 2002 (COSHH) Leaflet INDG136(rev2) HSE Books 2003 (single copy free or priced packs of 10 ISBN 0 7176 2677 6)

Respirable crystalline silica dust CHAN35 http://www.hse.gov.uk/pubns/chan35.htm

Provision of welfare facilities at fixed construction sites Construction Information Sheet CIS18(rev1) HSE Books 1998

Provision of welfare facilities at transient construction sites Construction Information Sheet CIS46 HSE Books 1997

Further information

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This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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