Control of exposure to silica dust in small potteries

Ceramics Information Sheet No 2

Introduction

This information Sheet has been produced by the Health and Safety Executive (HSE) in consultation with the Ceramics Industry Advisory Committee (CERIAC), the Schools Education Advisory Committee (SEAC) and the Higher and Further Education Advisory Committee (HIFEAC). It contains advice for small and medium-sized potteries on the risks from dust containing respirable crystalline silica (ie from clay and glazes) and the precautions necessary to minimise exposure.

The guidance will also be of use to those who work in the craft and educational sectors, even though exposure levels in these premises are likely to be lower. It describes good methods of working and will be useful to managers, supervisors, safety representatives, employees, teachers, craft potters and students.

This information sheet is in three parts:

- general background information under the following headings:
  - Silica dust exposure and risk;
  - Silica dust control;
  - Control measures for reducing exposure;
  - Legal requirements;
- table of poor working practices and precautions; and
- references to more detailed information.

Silica dust exposure and risk

Clay contains crystalline silica, most of which is chemically combined with other materials. The crystalline silica that is not chemically combined is often referred to as 'free silica' and in this form it poses a serious health risk.[1]

Fine dust particles (known as 'respirable' particles) containing free silica are a major concern because they can:

- be invisible to the naked eye under normal lighting conditions (They may be made visible by using a dust lamp[2]);
- be airborne for long periods of time in your breathing zone; and
- penetrate deep into the lungs when inhaled.

For the rest of this information sheet, respirable particles of free crystalline silica are referred to as 'silica dust'.

Breathing in silica dust may ultimately lead to a lung disease known as silicosis. This is an irreversible debilitating scarring or fibrotic lung disease which continues to develop after exposure has stopped. The greater the airborne concentration of silica dust and the more prolonged the pottery worker's exposure, the greater the risk.

The maximum exposure limit (MEL) for silica dust is 0.3 mg/m^3 (averaged over eight hours). This limit should not be exceeded and exposures should be reduced as far below this level as is reasonably practicable. However, prolonged exposure to levels of silica dust below the MEL may still present a health risk and HSE recommend health surveillance for people who are exposed to more than 0.08 mg/m^3 over an eight-hour time period. Further advice on health surveillance is given in the CERIAC booklet *Health surveillance*.[3]

The risk of contracting silicosis at silica dust exposures below 0.08 mg/m^3 (averaged over eight-hours) is extremely low. Following the precautions described in this information sheet should help to keep exposures below this level.

The free silica content of different clays and different pottery bodies varies widely and is therefore important when considering risk. In general, the higher the free silica content, the greater the risk (see Table 1).

Table 1 Free silica percentages

Clay material/constituent	Approximate % free crystalline silica by weight
China clay	1 or 2
Ball clay	33 to 37
Fireclay	Usually 1-5, but can be 10+
Cornish stone (granite)	30 to 40
Calcined flint	Almost 100
Feldspar	1 to 3
Earthenware	30 to 39
Stoneware body	20 to 30
Tile granulate	30 to 40
Sanitary ware	25 to 40
Red body (Rockingham)	20 to 30
Bone china body	8 to 12

Table 2 Poor working practices and precautions to reduce exposure

Source	Poor working practices	Precautions
Handling powdered raw materials (body preparation, glaze preparation) Dust containing silica is generated through poor working practices	Dust produced by: Bag slitting Manual dispensing Shovelling of raw material Spillages Disposal of empty bags	Change to premixed materials Receive raw materials in larger containers for handling by fork-lift truck Avoid shovelling dry powder Dispense powders under local exhaust ventilation (LEV), placing empty bags into plastic sacks inside the hood fitted with LEV Clear spillages quickly, ie by using a suitable vacuum cleaner fitted with a high-efficiency performance (HEPA) filter **DO NOT DRY SWEEP** - see section on floors Train operators in the risks and safe methods of working
Clay casting slip	Gross spillages due to pipe/mould failure Leakages Accumulations of minor spillages	Maintain slip pipes, connections, valves - inspect on a regular basis Ensure good quality mould manufacture to reduce leakages Pipe slip returns back to arc rather than bucket Clear up spillages before they dry out Train operators in safe methods of working
Plastic clay	The drying out of clay scraps that have fallen on to the floor	Do not allow clay to dry out Provide sufficient number of scrap bins Do not allow scrap bins to become overfull before emptying them Keep floors clean **DO NOT DRY SWEEP** - see section on floors Return scraps to the blunger or, if not possible, keep damp Train operators in safe methods of working
Floors etc Clay which dries out and settles out on the floors of pottery workrooms and the fine dust which settles on ledges and shelves contains silica (and other hazardous substances) and can become a serious health hazard	Spilled material being allowed to dry out Poor methods of working Poorly constructed floors Inadequate cleaning procedures Plant and equipment that cannot be moved for cleaning	Where practicable, construct floors with smooth, impervious surface Regular cleaning is essential Clear up spillages before they dry out **DO NOT DRY SWEEP** - dry sweeping is prohibitied. Sweeping with sawdust which is thoroughly damp and **kept** damp is permitted **only** where other more effective methods are impracticable

Source	Poor working practices	Precautions
Floors etc (continued)		Clean by true wet methods or where this is not reasonably practicable dustless methods, ie use a suitable vacuum cleaner fitted with a HEPA filter. In wet environments a residual current device (RCD) that is incorporated into the electrical supply is considered essential. Plug-in types are considered unsatisfactory for industrial use. Store materials off the floor to allow cleaning beneath them Use castors on tables etc to move them out of the way for cleaning Train operators and supervise contractors in 'low dust' methods of working
Moulds Outside of mould becomes caked with dried slip which produces a fine dust of silica whenever it is disturbed, eg the removal and replacement of the rubber retaining bands for the moulds or the knocking together of moulds during assembly (The major risk during casting arises when the outside of the mould becomes caked with dried slip. The HSE survey showed that if mould contamination is minimised it can more than **halve** the exposure of casters to silica dust.)	Mould overfilling causing slip to run down the sides of the mould which dries out Failure to turn the supply off when moving from one mould to the next The stacking of moulds immediately after turning out	Adjust the flow of slip so that it is suitable for the size of mould Provide a tap to turn the slip supply off between mould fillings Hold a small container under the slip pipe between the moulds to catch the drips Do not stack moulds on top of one another when pouring out Clean off spillages when damp Use wires rather than elastic bands, where practicable, to hold moulds together Train operators in safe methods of working
Fettling of finished goods Dry fettling in an open workshop can produce personal exposures to silica dust equivalent to 0.08 mg/m^3 (eight-hour TWA) (the level at which HSE recommends health surveillance due to the residual risk) and should **not** be carried out. Where possible, ware should be finished by sponging rather than fettling to reduce exposure to silica dust	Totally dry fettling without the use of a fettling hood Fettling with only the minimum wetting Incorrect use of fettling hoods, eg not standing close enough to the hood or stacking work tools inside the hood	Arrange production so that both fettling and sponging can be carried out on wet pieces simultaneously Limit the amount of fettling by improving production methods and accuracy of moulds Use damp sponging where practicable Only dry fettle in **hoods** fitted with suitable LEV Train staff to use hoods fitted with LEV correctly - ensure they stand close enough to the hood and hold the workpiece far enough into the hood for it to be effective and view the workpiece through the top glass plate Ensure hoods or working positions can be adjusted to allow for different user heights, eg by the use of duckboards provided this does not create a tripping hazard Carry out regular inspection, servicing and thorough examinations of LEV systems to ensure they remain effective Train staff in how to use hoods fitted with LEV to best effect and reports any defects

Source	Poor working practices	Precautions
Biscuit brushing Dust generated by the operation	Biscuit brushing without the use of LEV	Use equipment fitted with adequate LEV Carry out regular inspection, servicing and thorough examinations of LEV to ensure they remain effective Train staff in how to use hoods fitted with LEV to best effect and reports any defects Keep area clean
Glaze spraying Atomisation of glaze producing droplets containing respirable silica	Glaze spraying without the use of hoods fitted with LEV or suitable and sufficient respiratory protective equipment	Only carry out work in suitable spray hoods fitted with LEV Carry out regular inspection, servicing and thorough examinations of LEV systems to ensure they remain effective Where necessary, use suitable and sufficient respiratory protective equipment (RPE) Train staff in how to use hoods fitted with LEV to best effect and reports any defects Clean up spillages before they dry out
Inappropriate personal protective equipment (PPE) The correct selection and use of PPE is important as work clothing itself can become contaminated with silica dust and release a cloud of particles, which rise in the warm layer of air near to a person's body into their breathing zone	Operators not wearing appropriate work clothing	Only wear overalls specifically designed for use in potteries Do not wear cotton overalls Launder overalls regularly to avoid build up of dry clay (overalls should not be taken home and employers should arrange for regular laundering of overalls to avoid the build up of hazardous substances). Provide separate accommodation for personal and protective clothing to avoid cross contamination, eg split lockers
Inadequate information, instruction and training It is very difficult to appreciate the potential risk from fine silica dust clouds that you cannot see. Employers need to provide adequate information, instruction and training. This is to ensure that employees and others understand the hazards of the materials they are working with and the risks they are taking if they do not follow good methods of working.	Operators exposed to silica dust as a result of being unaware of the risks created by their actions and the appropriate precautions to take	Provide employees (and contractors, where necessary) with information, instruction and training which covers: ● the health hazards associated with silica dust; ● the nature of the dust (ie small particles are not visible to the naked eye); ● potential sources of silica dust; ● the importance of dust conscious methods of working; ● the correct operation and use of control measures; ● how to report defects in any control measures in place.

Silica dust control

Methods used to achieve adequate control of exposure to silica dust are often simple, inexpensive and based on good methods of working. By limiting unnecessary airborne dust generation these methods may also improve product quality and productivity.

HSE undertook a survey of small and medium-sized potteries to:

- characterise the exposure to silica dust;
- pinpoint the work groups significantly exposed; and
- identify the causes of significant exposure and how these may be effectively reduced.

The survey found that the highest exposures were measured in casting, fettling and workroom cleaning. High exposures are also likely to be generated in premises where pottery bodies are produced in house from raw materials.

Poor working practices and the control measures necessary to reduce exposure are summarised in Table 2. Ways of reducing exposure include:

- following good methods of working;
- using effective local exhaust ventilation, eg fettling hoods;
- good standards of cleanliness;
- using appropriate personal protective equipment and ensuring it is laundered regularly; and
- providing employees and others with adequate information, instruction and training.

Control measures for reducing exposure

To minimise the exposure of pottery workers to silica dust, consideration needs to be given to the control measures listed below. If applied together, as an integrated set of elements, these measures will ensure adequate control:

- modifications to a process;
- controls applied to a process, such as local exhaust ventilation (LEV);
- wearing pottery overalls (designed to restrict the retention and release of dust while being comfortable to wear); and
- methods of work which minimise exposure.

The HSE survey showed that reducing exposure does not necessarily mean introducing expensive hardware into the workplace. Indeed, simply changing methods of working and a commitment to ensure these changes are maintained can have a significant effect on reducing exposure levels. To achieve this, an ongoing programme of instruction, training and information for employees is necessary, so that they understand the reasons for the required precautions and the correct methods of working to adopt.

Legal requirements

Where products containing silica dust are used, employers and the self-employed have duties under the Control of Substances Hazardous to Health 1999 (COSHH)[4] to:

- identify the work operations and other sources which generate silica dust and assess the risks created to the health of those exposed;
- prevent exposure to silica dust or, where this is not reasonably practicable, adequately control exposure by process modification, enclosures, local exhaust ventilation, correct methods of working etc.
- maintain local exhaust ventilation equipment in efficient and effective working order and regularly check that people are using the correct methods of working, personal protective equipment etc;
- ensure that local exhaust ventilation equipment is thoroughly examined and tested at least once every 14 months and keep suitable records;
- reduce exposure to silica dust as far as is reasonably practicable below the maximum exposure limit (MEL).
- monitor employees' exposure to silica dust, using qualified, experienced and competent staff, if you are unsure whether controls are adequate and exposures are below 0.08 mg/m^3;
- arrange for appropriate health checks where it cannot be demonstrated that exposure of persons to silica dust is below 0.08 mg/m^3 (ie ensure that medical surveillance of those likely to be exposed is carried out under the supervision of a suitably qualified competent medical practitioner); and
- inform, instruct and train all employees who may be exposed to silica dust about how to work safely and supervise and correct their methods of working where necessary.

References

1 *Silica dust and you* Leaflet MSA15(rev1) HSE Books 1997

2 *The dust lamp: A simple tool for observing the presence of airborne particles* MDHS82 HSE Books1997 ISBN 0 7176 1362 3

3 *Health surveillance: A ceramics industry booklet* IACL100 HSE Books 1996

4 General COSHH ACOP *(Control of substances hazardous to health) and Carcinogens ACOP (Control of carcinogenic substances) and Biological agents ACOP (Control of biological agents). Control of Substances Hazardous to Health Regulations 1999. Approved Codes of Practice* L5 (Third edition) HSE Books 1999 ISBN 0 7176 1670 3

Further reading

Control of substances hazardous to health in the production of pottery L60 HSE Books 1998 ISBN 0 7176 0849 2

Workplace inspection: *A ceramics industry booklet* IACL55 HSE Books 1996

While every effort has been made to ensure the accuracy of the references listed in this publication, their future availability cannot be guaranteed.

Further information

The Stationery Office (formerly HMSO) publications are available from The Publications Centre, PO Box 276, London SW8 5DT Tel: 0870 600 5522 Fax: 0870 600 5533 Website: www.clicktso.com (They are also available from bookshops.)

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165 Fax: 01787 313995 Website: www.hsebooks.co.uk (HSE priced publications are also available from bookshops.)

For information about health and safety ring HSE's InfoLine Tel: 08701 545500 Fax: 02920 859260 e-mail: hseinformationservices@natbrit.com or write to HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG. You can also visit HSE's website: www.hse.gov.uk

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

Printed and published by the Health and Safety Executive 4/02 CEIS2 C50