

Control of risk from stone dust containing high levels of crystalline silica

Chris Keen CFFOH



Background: Engineered stone risk



In GB 42 cases (silicosis/silica associated lymphadenopathy) associated with artificial/engineered stone

Age groups:

- 16-24: 2 cases
- 25-34: 10 cases
- 35-44: 14 cases
- 45-54: 11 cases
- 55-64: 4 cases
- 65+: 1 case

All males - 40 stonemasons, 1 kitchen fitter, 1 construction worker.

Source : The Health and Occupation Research network (University of Manchester)

HSE Project Objective

Monitor the effectiveness of water suppression as part of a suite of control measures to protect workers from exposure to respirable crystalline silica (RCS) when processing high crystalline silica (HCS) content stones.

Visit Methodology

Exposure monitoring (personal sampling) at 6 fabrication sites to measure RCS exposures of all relevant workers (with informed consent)

Sites selected to represent good exposure control practice

Other air sampling to better understand risk from other contaminants (volatile organic compounds (VOCs), metals)

Bulk samples of high silica stones and process water

Occupational hygiene assessment against benchmarks in HSE guidance

Relevant HSE guidance

PUBLICATIONS AND
PRODUCTS FROM 

Controlling exposure
to stone dust



Health and Safety
Executive

ST0

COSHH essentials for stone
workers: Silica

Advice for managers



Health and Safety
Executive

ST1

COSHH essentials for stone
workers: Silica

Primary and secondary sawing

Control approach 1:
Respiratory protection



Health and Safety
Executive

ST2

COSHH essentials for stone
workers: Silica

Automated boring and polishing using rotary tools

Control approach 2:
Respiratory protection



Health and Safety
Executive



Health and Safety
Executive

G404

COSHH Essentials:
General guidance

Health surveillance for those exposed to respirable crystalline silica (RCS)

Control approach 4: Special

ST3

COSHH essentials for stone
workers: Silica

Cutting and polishing using hand-held rotary tools

Control approach 2: Engineering control and
Respiratory protective equipment (RPE)

General overview of sites visited

Between 8 and 35 workers employed in fabrication

Majority of throughput HCS resin based engineered stones at 5 sites (one site using lower crystalline silica raw materials)

Most processes subject to water suppression (some dry cutting/grinding at 3 sites)

A range of (mainly) CNC controlled fabrication machinery :

- Routers (machining centres)
- Bridge saws
- Water jet cutters
- Edge polishers
- + others (splitters, mitre saws)

Plus hand finishing (polishing with some cutting/grinding)

Initial findings

8 hour TWA RCS exposure measurements by job

Job	Number of measurements	Number ND	Max (mg/m ³)	Median (mg/m ³)	P90 (mg/m ³)	Number > WEL
Saw operators	16	5	0.099	0.015	0.032	0
Saw/water jet combi	12	4	0.054	0.015	0.051	0
CNC operators	17	4	0.057	0.016	0.036	0
Edge polishers	18	5	0.094	0.021	0.070	0
Hand finishers*	52	9	0.154	0.033	0.075	3
Multi-task	10	3	0.118	0.019	0.091	1
Other (ancillary)	30	17	0.024	0.008	0.019	0
Stonemason**	6	0	0.821	0.250	0.670	4
Total	161	47	0.821	0.019	0.072	8

*Includes some workers doing small amounts of dry cutting

** Includes significant dry cutting with LEV

RCS airborne concentrations – static sampling

Useful to assess the spread of airborne contamination

Reflects multiple emission sources in a single space

Number of measurements	Number ND	Max (mg/m ³)	Median	P90
66	31	0.197	0.014	0.051

Other air sampling results

Mix of personal and static samples

Metals (inhalable and respirable fractions) – results indicate very low exposure potential

VOCs – some elevated results – further investigation ongoing

Initial observations – exposure control – large machines

Opportunity for improved control of mist by better enclosure of emission source (flexible plastic strips/baffles)

All enclosures open at the top – leakage of fine particulate observed at multiple machines

Important to control cleanliness of supplied water

Water nozzles not always positioned optimally



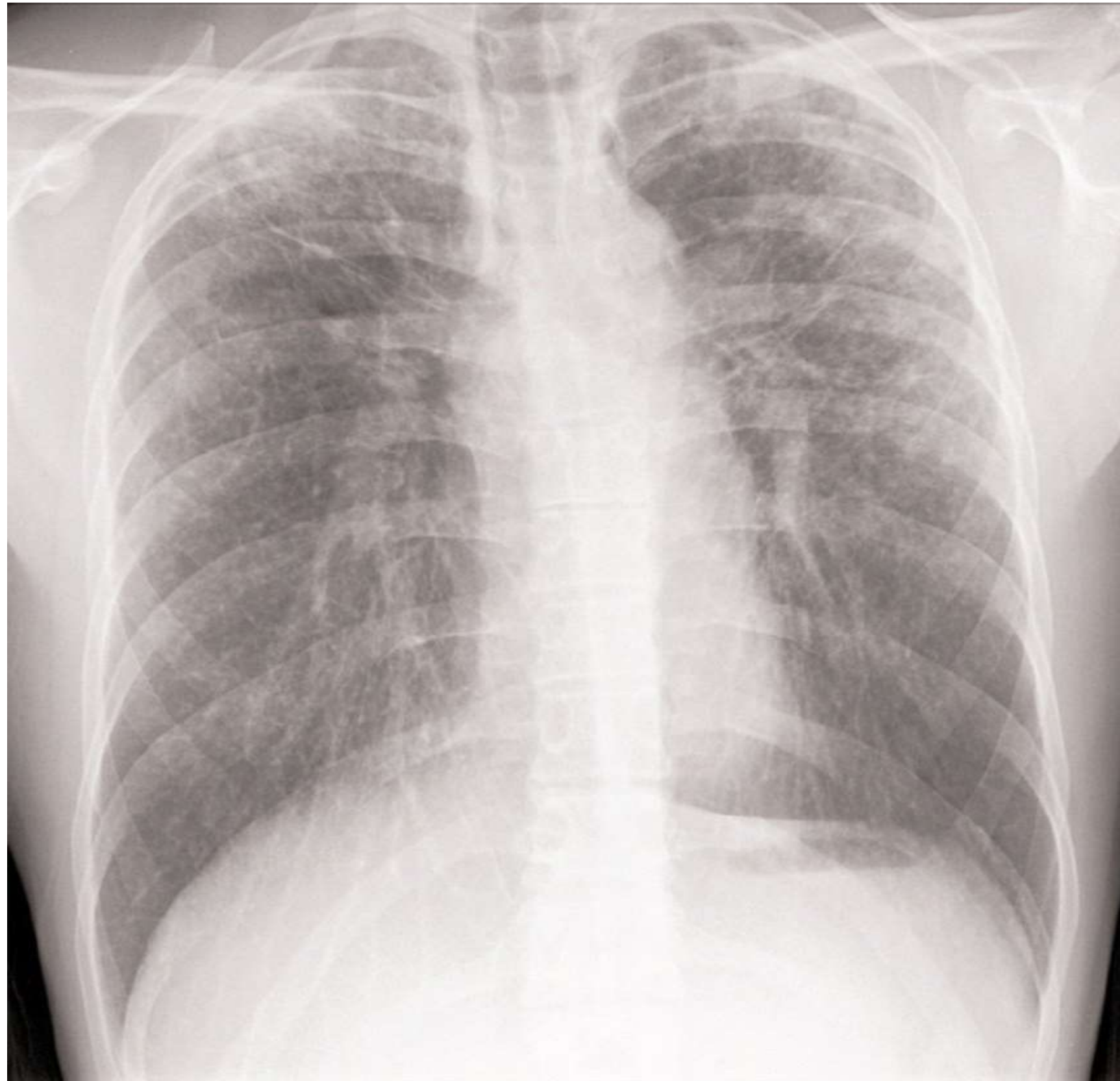
Initial observations – exposure control – hand polishing

Water wall booths used at some sites

Some sites supplying clean, mains water to hand polishers

Capture hoods at one site – inappropriate hood design for this process - very poor capture efficiency

Other findings



Five sites conducted health surveillance including spirometry, but only 1 site visited conducted chest x-rays

RPE usage was not consistent across the sites visited

There is a clear move towards lower crystalline silica products for worktop manufacture – these will reduce risk but adequate control is still required

Process water

Water suppression

- Recycled water generally treated with flocculants/coagulants but not always filtered
- Measurable concentrations of particulate and crystalline silica in recycled water being supplied to machines and hand polishers (up to 2.8 mg/ml crystalline silica)
- Clean water required for some tooling (e.g water jet) and by warranty conditions on large machines
- Potential legionella risk
- Further research needed

Water suppression

It is possible to manufacture kitchen/bathroom worktops from HCS stone, including resin based ES, using wet methods at all stages of the process.

It is necessary to control the mist generated from wet fabrication activities through application of Hierarchy of Control :

- Reduce the RCS content in the mist
- Reduce mist generation with baffles/lower cutting speeds
- Control the mist at source with effective enclosure
- Capture mist emissions using LEV
- Control residual risk with RPE

Emerging conclusions

Water suppression is important to control the risk when processing HCS stones

BUT

Control is complex and will rely on additional measures to control the mist generated

The measured RCS exposures reflect good control practice

Some companies generally managing RCS risks well still perform small amounts of dry cutting/grinding, which can result in overall exposures which exceed the WEL



Further research

- VOC exposures
- Impact of contaminated water on exposures
- Legionella risk in process water

Thankyou for listening

Questions ?

This study was reviewed by the Health and Safety Executive's Research Ethics Panel which operates under delegated authority from the University of Sheffield Medical School Research Ethics Committee (Reference REP 24-012, Date 20/11/24).