HSE initiatives on control of exposure to Respirable Crystalline Silica (RCS) in Stone Working

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Acknowledgements

• HSL
  – Peter Stacey: artificial stone
  – Chris Keen & Peter Baldwin: exposure measurements

• HSE
  – Ian Smart & Chris Lucas: industry input and guidance
  – Tahir Mortuza & colleagues: proactive inspections
Overview

i) Stone manufacturing industry & exposure to RCS

ii) Importance of type of stone – natural & artificial

iii) Available control measures

iv) Influence improvements in control – guidance

v) Monitor progress / compliance - survey & inspection

….and a few conclusions
i) Stone manufacture – industry

- Stone manufacturing industry
  - traditional / heritage, memorials, surfaces/worktops
  - ~6500 workers in 1300 companies, most SMEs
  - fairly even distribution across country

- Dust generation depends on
  - direct activities and duration: cut, chisel, grind, polish
  - resuspension of surface dust
  - type of stone processed
i) Stone manufacture – RCS hazard

- Inhalation of RCS is harmful
  - can cause silicosis, COPD and lung cancer
  - 800 deaths from lung cancer per year in GB
  - no EU harmonised classification as carcinogen

- Workplace Exposure Limit (WEL)
  - 0.1 mg/m³ (8hr TWA)….same as arsenic
  - not ‘no effect level’ – 2.5% risk of silicosis over 15 years
### i) Stone manufacture – RCS exposure

Summary of some initial measured exposures to RCS (2003-13 from HSL & industry)

<table>
<thead>
<tr>
<th>Task</th>
<th>No. workers</th>
<th>Geometric Mean (mg/m³ 8 hr TWA)</th>
<th>90th %ile</th>
<th>% &gt; WEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary saw</td>
<td>15</td>
<td>0.05</td>
<td>0.14</td>
<td>11.1</td>
</tr>
<tr>
<td>Secondary saw</td>
<td>90</td>
<td>0.15</td>
<td>0.29</td>
<td>46.5</td>
</tr>
<tr>
<td>Hand mason</td>
<td>34</td>
<td>0.45</td>
<td>0.98</td>
<td>55.0</td>
</tr>
<tr>
<td>Surface roughening</td>
<td>11</td>
<td>0.25</td>
<td>0.60</td>
<td>66.7</td>
</tr>
<tr>
<td>Polishing</td>
<td>11</td>
<td>0.09</td>
<td>0.19</td>
<td>35.7</td>
</tr>
<tr>
<td>Maintenance</td>
<td>10</td>
<td>0.07</td>
<td>0.19</td>
<td>18.2</td>
</tr>
</tbody>
</table>
ii) Types of stone: natural with % silica

- Basalt (5%)
- Limestone (5%)
- Granite (30%)
- Red Brick (30%)
- Slate (40%)
- Quartzite (>70%)
- Sandstone (>70%)
(ii) Types of stone – artificial / synthetic

• ENGINEERED or AGGLOMERATED STONE
  • stone particles mixed in resin and pressed
  • silica stones or alumina in polyester resin or concrete
  • not produced, but processed in UK, for worktops / surfaces

• TERRAZZO
  • stone fragments in binder to create surface on floors
  • made, cured, and polished in situ eg hotel fit-outs
  • binder can be polymer (often epoxy) or concrete

• CAST or RECONSTITUTED STONE
  • use of cement to resemble natural stone
  • visual modifiers eg agglomerates on surface, resin/rubber veins, blasting surface, fibre reinforcement
  • produced as garden ornaments, paving etc
(ii) Types of stone – comparisons

Engineered stone v natural stone

- increasing use for surfaces - impervious to liquid spills
- hazards poorly recognised
  - unaware of composition
- could cut differently
  - may be harder and impact on cutting blade
  - cutting temperature may burn resin / release toxic products
  - generate more dust - change masks every 20hr not 40hr?
iii) Available controls - approach

HIERARCHY OF CONTROL

Eliminate / reduce RCS dust generation
  • buy stone pre-cut eg memorials
  • use hand rather than power chisel

Control at source
  • water suppression
  • extraction

Work Practices
  • segregation / enclosure …but extract!
  • house-keeping
  • training especially in use of controls

PPE
  • RPE: APF at least 20 (eg FFP3) often need APF of 40 (eg TH3)
  • synthetic coveralls

For RCS in stone dust need combinations of controls
Research on (a) control efficiencies and (b) how work in combination
iii) Available controls – water suppression
(iii) Available controls - extraction

Systems include:
- booths (+ water-backed booths)
- capture hoods
- down-draught benches
- on-tool extraction

Worker aspects
- trained to use
- maintain and report faults
iii) Available controls – work practices

SEGREGATION
- enclose and extract
- usually required

HOUSE-KEEPING
- regular cleaning to prevent resuspension
- vacuum or wet brush NOT dry sweeping / compressed air
- Class M vacuum (or higher)
iii) Available controls – PPE

**RPE**
- Needed for high energy tasks even if using water suppression
- APF of at least 20 eg FFP3 disposable/re-useable half mask respirator
- usually need APF of at least 40 eg TH3 or TM3 powered respirator
  - if silica content > 30% and
  - if using power tools

- **COVERALLS**
- synthetic not cotton – so do not retain dust
- original research on terylene, but others used now
- avoid dry brush or compressed air to clean dust off them
iv) Influence - develop guidance

• COSHH Essentials sheets
  Stone & slate series into one ST series
  • Primary & secondary saws
  • Automated and hand-held rotary tools
  • Hand and pneumatic chiselling
  • Slate – saw, split and dress

• HSG201
  Outdated – WEL, exposure data, controls…
  Update info & create as web pages
iv) Influence - communication

Communicate with stakeholders

- Natural Stone Show in April 2015
- Safety & Health Awareness Days (SHADs)
- stone micro-website http://www.hse.gov.uk/stonemasonry/index.htm
- HSE stonework e-bulletin
v) Monitoring - survey

Research on stone working sites (SRP project)

• occ hygiene surveys and health surveillance on 10 sites (2012-13)

• interventions: feedback in site reports, training managers & re-visits to train workforce

• advice accepted, no health-based enforcement needed

• repeat measurements in 2016-17, to inform future work
v) Monitoring - compliance

Proactive inspections
- stone initiative in South-East

• inspection of 60 stone working sites in June-Sept 2015

• 35/60 (58%) companies in breach of H&S law
  • types of action taken
  • Fee For Intervention

• Main enforcement topic was RCS
v) Monitoring – compliance (cont)

<table>
<thead>
<tr>
<th>RCS ISSUES</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>LEV</td>
<td>~ 25</td>
</tr>
<tr>
<td>RPE</td>
<td>~ 25</td>
</tr>
<tr>
<td>Health Surveillance</td>
<td>~ 20</td>
</tr>
<tr>
<td>Cleaning</td>
<td>~ 10</td>
</tr>
<tr>
<td>PPE (excluding RPE)</td>
<td>~ 5</td>
</tr>
<tr>
<td>Water suppression</td>
<td>~ 5</td>
</tr>
<tr>
<td>Risk assessment</td>
<td>~ 5</td>
</tr>
<tr>
<td>Other</td>
<td>~ 5</td>
</tr>
</tbody>
</table>
v) Monitoring – compliance (cont)

Stonyhurst College (May 2014)
- worker had silicosis, exposures 80xWEL, fine & costs ~ £131,500
Conclusions

• RCS is still poorly controlled on many stone working sites
  ➢ proactive visits will continue

• Need to raise awareness of ‘adequate control’
  ➢ HSE website and stone e-bulletin

• Improve our own understanding
  ➢ control efficiencies and combinations
  ➢ implications of new trends eg artificial stone
  ➢ reasons for poor control practices