08 APPENDICES

A MAPS

B AUDIT DATA SHEETS — PROVIDED SEPARATELY

C OUTLINE GUIDANCE & SPECIFICATION NOTES

D POTENTIAL PROJECT COSTS

E HEALTH & SAFETY

A MAPS

01 SANDSTONE CHUCHES IN & AROUND THE GREENSAND COUNTRY

02 DISTRIBUTION OF MINOR SANDSTONE STRUCTURES ACROSS THE GREENSAND COUNTRY

2 x A3 INSERTS

PRINT WITHOUT SCALING
(ORIGINALS ARE A3)

B AUDIT DATA SHEETS

Provided separately — other than an example page — are electronic (PDF) copies of the 505 data sheets that form the basis of the Sandstone Structures Audit. These are the output of a database created using FileMaker Pro 14, a cross–platform software package which can be read and manipulated (but not fundamentally altered) on an iOS device (not Android) using the free application FileMaker Go: http://www.filemaker.com/products/filemaker–go.

Each data sheet is assigned two unique numbers: a **three digit** (**red**) record identifier; and a **six figure** (**blue**) structure reference comprising a three letter parish code and a three digit identifier (the audit is sorted alphabetically by parish).

The fields on each data sheet are grouped:

A **Locational information:** Parish, Local Authority and — if relevant — County.

B **Address** including full postcode and **eight** figure OS National Grid Reference.

C **Heritage data:** whether the structure is in a Conservation Area or Registered Landscape, statutorily Listed (with grade) or a Scheduled Monument. The contribution of the structure to the landscape character of the Greensand Country is categorised as either Positive or Low (Neutral), albeit all associated with conservation areas, listed buildings, etc. are classed as Designated.

D **Usage + Typology** and if the latter is a wall, whether it is a retaining wall.

E **Fabric:** All stonework is classified as Random or Squared Rubble, with style of walling for each category also recorded. The presence and predominant type of other materials is noted, along with a cursory assessment of condition:

- **Good:** No visible sign of any defect or deterioration (generally new work).
- **Reasonable:** Weathered but not excessively so, with perhaps some loose or missing pointing, etc. but not so serious as to be of immediate concern.
- **Poor:** Structural cracks, excessive leaning or distortion, missing copings and loss of stonework creating a need for short–medium term attention.
- **At Risk:** Seriously deteriorated with collapse occurring or imminent, and in danger of total loss if the situation is allowed to continue.
- **Not seen close:** Inaccessible, obscured by vegetation, etc.

F A placeholder (container) for a single **Photograph** — which can be added in a variety of ways, including via FileMaker Go on a mobile device — and a 4–line space for freeform **Notes**.

Each structure reference can be directly related to labelled points stored in a separate GIS shape file, which enables all locations to be viewed as an overlay to large scale OS Mastermap data (22 x 5km square tiles needed). It should be noted that the fixed, three digit internal ID for each record in the shape file is **not** the same as the FileMaker Pro record identifier; it is the structure reference that is important.

AUDIT DATA 322 LBR 019

EXAMPLE

Parish Little Brickhill

Local Authority Milton Keynes Council

County n/a - Unitary

Address Rothbury
Watling Street
Little Brickhill
Milton Keynes MK17 9NW

Grid Ref SP 9095 3242

Conservation Area (●) Yes ( ) No

Registered Landscape ( ) Yes (●) No

Listed Building ( ) I ( ) II* (●) II ( ) Unlisted

Scheduled Monument ( ) Yes (●) No

Heritage Value (●) Designated ( ) Positive ( ) Low or Neutral

Usage Residential **Typology** Wall **Retaining** ( ) Yes ( ) Part (●) No

Stonework (●) RANDOM RUBBLE ( ) SQUARED RUBBLE

(●) Uncoursed ( ) Coursed ( ) Polygonal ( ) Herringbone or Diagonal

Other Materials (●) Yes ( ) No **Type (main)** Brick

Condition ( ) Good (●) Reasonable ( ) Poor ( ) At Risk ( ) Not seen close

Notes Part of boundary wall (mainly brick) to Lion House.

C OUTLINE GUIDANCE & SPECIFICATION NOTES

01 INTRODUCTION

Set out in this Appendix is technical information to guide the specification of repairs to sandstone structures, including information on the supply of stone and materials for mortar. The approach is 'conservative' in that it presumes the maximum retention of original (historic) fabric, and repair methods which are compatible with traditional masonry and construction. It covers:

- Maintenance and management.
- Stone.
- Mortars.
- Repointing.
- Indent (stone replacement) repairs.
- Rebuilding.
- Restoration and new work.

Mortar repairs are not included as these are generally unsuitable for potentially friable sandstone; likewise cleaning. SPECIFICATIONS ARE PROVIDED FOR GUIDANCE ONLY AND SHOULD NOT BE USED DIRECTLY TO PROCURE ANY WORKS; THEIR PURPOSE IS TO INFORM THE SPECIFICATIONS OF OTHERS, TO WHICH END THEY SHOULD BE ADAPTED AND DEVELOPED TO SUIT THE CIRCUMSTANCES OF A PARTICULAR PROJECT. References to suppliers are current at the time of writing, but should be checked for change.

02 MAINTENANCE & MANAGEMENT

The basis of all conservation (of buildings and structures) is good maintenance and management as 'prevention' is always better than 'cure', i.e. the prioritisation of simple repairs and anticipating problems can avoid the need for potentially major works sometime in the future. Key issues for minor sandstone structures are:

- **Day–to–day checks and inspection:** to identify at an early stage concerns such as invasive vegetation, the need for repointing and resetting loose copings, and — if necessary — specialist advice. Simple records should be kept, including photos (the same picture taken at intervals can be useful).
- **Vegetation control:** while lichens, mosses, creepers, etc. are in most cases benign and part of the character of historic structures, there are instances where vegetation can cause damage and hence should be removed. While not always a problem, ivy will need to be removed if woody, secondary growths are penetrating mortar joints, though it should never be pulled from a wall; the plant must be killed first, which may mean having to temporarily remove then reset

stones in the same way as the indent (stone replacement) repairs described in Section 06. Other penetrating, woody growths should be similarly treated. Attention should also be paid to self–sown trees and other shrubs which may encroach on the stonework and cause displacement or collapse.

For larger structures, a formal maintenance regime should be considered, especially if piecemeal repairs are to be carried out over a period of time (all repairs should be recorded in a way that can easily be retrieved by others).

C.01: IVY PENETRATING JOINTS

C.02: HOLLY TREE DAMAGING WALL

03 STONE

03.01 SUPPLY

New stone for the repair of sandstone structures within the Greensand County can be obtained from two operating quarries:

- Cainhoe Quarry on the A507 southeast of Clophill (TL102375), owned by **Thomas Brothers Excavations (Luton) Ltd.**
  Cainhoe Road — Telephone: 01582 594111
  Beadlow
  Bedfordshire MK45 4HH
- The large sandpits east of Heath & Reach (SP927287), owned by **L. B. Silica Sand Ltd.**
  Byrants Lane — Telephone: 01525 372000
  Heath & Reach
  Bedfordshire LU7 0AL

Both quarries are primarily worked for aggregates (sands) but will supply building stone on request. Details are correct as of March 2019. Other quarries may be able to provide small quantities of stone locally; enquiries should be made direct.

03.02 PREPARATION

New stone must be carefully selected so as to ensure that it is free from any defects that could adversely affect its integrity in use or the appearance of the completed work, e.g. unconsolidated (soft) pockets or hidden shakes (fissures); a proportion of wastage should always be presumed. Stones must be:

- Properly seasoned (stone freshly split from the rock contains salts and other quarry 'sap' which must be allowed to stabilise before the stone is used).
- Brought to the proper condition for use, meaning that stone should not be placed when saturated or — most importantly — frozen (in cold and wet weather, stones should be kept under cover until usage).
- Hand dressed. While machine cutting and shaping is a sensible and economical way of working stone, final dressing (finishing) must be carried out using hand tools, with particular attention paid to replicating the shape, surface texture, tool marks, etc. of existing stone to be repaired or restored.
- Marked with the natural bed following working, allowing for placing all walling stone 'on bed' and for the 'edge bedding' of copings.
- Handled with tackle or other suitable mechanical aids, noting the requirements of the *Manual Handling Operations Regulations 1992*.
- Generally worked in the quarry or workshop due to the health and safety issues associated with silica dust which — as it may cause silicosis and other respiratory illnesses including lung cancer — is a controlled substance.

Recycled stone arising from demolitions, fallen walls and the like may also be used provided it meets the above criteria. Damaged stones can be cut down and redressed for use where smaller stones are needed, provided they can still be correctly bedded, though this may be difficult with random rubble.

C.03: HORIZONTAL BEDDING PLANES

C.04: EDGE BEDDED STONE

04 MORTARS

The repair of sandstone structures should be based on mortars bound with lime (obtained by burning limestones or chalks at 900°C to 1,000°C so as to drive off carbon dioxide and leave calcium oxide), not modern Portland cements which — due to their high salt (sulphate) content and 'strength' (low porosity and permeability) — are generally harmful to traditional masonry.

04.01 MATERIALS

Building mortars comprise a mix of binders, aggregates and water (which reacts with the binder as the mortar 'sets'). There are various types of lime:

- **Calcium lime putty:** CL90 to EN 459–1:2015. Matured for 3 months or longer and supplied in plastic tubs. A very pure lime made by 'slaking' quicklime in water and removing (sieving out) lumps so as to leave a smooth, consistent mass of gelatinous binder that sets by reaction with carbon dioxide in the air, a process known as carbonation. A number of firms produce CL90 putty. For reasons of health, safety and quality control, site slaking is discouraged.
- **Natural hydraulic lime:** NHL 2.0 or 3.5 to EN 459–1:2001. Made by the burning of limestones that contain clay and other impurities, and which when mixed with water have a 'chemical' set, i.e. air is not essential for carbonation though all NHLs contain a proportion of 'free' (pure) lime. Supplied in bags as a powder, NHL is branded either by producer (e.g. St. Astier) or importer (e.g. Hanson UK or Singleton Birch).
- **Quick lime:** unslaked calcium oxide supplied bagged in 'lump' (typically 40 mm), granular (e.g. 15 mm) or powdered form. Large scale production by firms such as Tarmac ('Calbux') who also supply limes for iron and steel production, and industrial, agricultural and environmental purposes. The basis of making lime putty (see above) though increasingly used for 'hot' lime mortars.

Earth may also be used as a binder (refer 05.03), though the nature and properties of this highly localised material are beyond the scope of this Appendix.

The principal **aggregate** for use with sandstones is a sharp sand, well washed and graded: Type S to BS 1200:1976 (replaced by BS EN 13139:2002 but still current) with clay content not exceeding 1–2% and with particle size restricted to the range 2.36mm to 150 microns. Leighton Buzzard sands are typical of the Greensand Country and available from local builders merchants. SOFT SANDS SHOULD NOT BE USED. Water should be clean and free from harmful matter.

Additives known as pozzolans are used to lend CL90 mortars a degree of chemical set where cold or damp might limit or compromise performance. A simple form of pozzolan is finely crushed brick albeit the particles may influence the colour of the mortar. Trass is natural pozzolan derived from volcanic rocks, used in northern Europe for many centuries. Metakaolin (a form of the clay mineral kaolinite sold under proprietary names, e.g. Agrical M1000), ground granulated blast furnace slag (GGBS) and low sulphur pulverised fuel ash (PFA) are also effective pozzolans.

04.02 SUPPLIERS

Limes, aggregates and additives are available from a number of specialist suppliers operating regionally and nationally. The Building Limes Forum provides an up–to–date list (https://www.buildinglimesforum.org.uk/about-lime/lime-suppliers/). Many suppliers have informative websites and highly knowledgeable advisors.

04.03 STORAGE & HANDLING

Calcium lime putty: Provide adequate dry, safe and secure storage of tubs in cool, frost free conditions. Party used tubs should have surface water returned and the lids tightly sealed to prevent carbonation.

Natural hydraulic lime: Provide adequate dry, safe and secure storage on site for bags of natural hydraulic lime. Store unopened bags of hydraulic lime in a dry, well ventilated place. Avoid wetting of lime before mixing. Open bags must be folded over, put into a dry store overnight and not used after the recommended shelf life.

Quicklime: Store as for natural hydraulic lime, noting that quick lime has a limited shelf life — usually three months — and will start to slake (convert to calcium hydroxide) if left in contact with the air.

Aggregates: To be protected from the weather but may be stored outside provided they pose no safety hazard and do not risk becoming contaminated. Aggregate must also be covered and protected from moisture, to prevent the washing out of fines and the 'separating out' of the graded material. Avoid intermixing and cross–contamination with other materials.

Additives: Store internally so as to ensure absolutely no cross–contamination. Check on delivery and reject any split or otherwise open bags. After opening, keep bags or containers sealed and covered.

04.04 MIXES

It is important to appreciate at the outset that when specifying and using lime (or any other) mortar there is no 'correct' mix. The 'design' of a mortar must start from an understanding of what is it intended to achieve and the conditions under which it will have to perform. Account must also be taken of the skills and experience of those who are to work with and 'place' the mortar, be they highly skilled stonemasons or perhaps general contractors wanting to 'do the right thing'. The key factors to consider at the outset are:

- **Durability:** the natural resistance of the masonry to weathering and decay, which in the case of the sandstones of the Greensand Country can generally be taken as 'moderate' though some of the more friable stones may have to be considered as 'weak'.
- **Condition:** little evidence of decay or surface erosion indicates stone in 'good' condition; 'moderate' means some surface loss or scaling, etc; and extensive loss of surface, and weak and powdery surfaces should be taken as 'poor'.

- **Exposure:** freestanding walls are subject to wetting both sides and — subject to the degree of shelter from driving rain provided by trees, buildings, etc. and proximity to roads and pavements (splashback and de-icing salts intensify exposure) — are best treated as being 'very exposed', with retaining walls perhaps considered as being in 'wet' conditions.

The different exposures and demands of mortars for pointing (exposed to air and the elements) and bedding (less exposed and hence less air for carbonation of free lime) should also be taken into account.

In general terms, the following mortar mixes are recommended generally:

- 1:2.5–3.0 CL90:sand + a pozzolan (10% PFA or Trass, or 5% Metakaolin or GGBS as a proportion of the volume of the lime:sand mix).
- 1:2:1 CL90:sand:crushed brick.
- 1:2.5–3.0 NHL2:sand (best avoided if the stone is weak).

Straight CL90 lime and 'hot' mixes may also be acceptable — the former for weak, friable stone and the latter (especially) for the bedding replaced or rebuilt stonework — subject to specification and placing by experienced persons. Pre-mixed mortars are available and can also be used. For retaining walls and copings in good condition, a 1:2.5–3.0 NHL3.5:sand mix can be considered.

Mixes are given for general guidance. Final proportions within the specified ranges should be adjusted to suit the size of aggregate (the smaller the aggregate the greater the proportion of lime) and weather conditions, aiming always to achieve the most permeable mortar within the given constraints of the joint width and exposure. FINAL SPECIFICATION SHOULD BE DETERMINED FOLLOWING TRIALS.

04.05 BATCHING

Measure materials for mortar into separate buckets or gauging boxes to suit the specified proportions. Completely fill and empty buckets or boxes at each batching, keeping dry at all times. Avoider gauging by shovel. Do not batch damp aggregates.

04.06 MIXING

CL90 lime mortars: By hand (small quantities) or using a pan mixer. A normal rotary cement mixer may be used if two or three smooth stones (cobbles) are placed in the drum, and its inclination reduced. In either case, do not add water.

NHL mortars: A normal cement mixer may be used. While in a dry state, mix half the sand with all of the lime to achieve a uniform colour. Add the remaining sand and mix well again. Continue mixing whilst slowly adding the least amount of water necessary to achieve a workable mix. Follow manufacturer's instructions for mixing large quantities. To improve workability, reduce the mixing time and soften the initial set 10% of CL90 putty — as a proportion of the weight of the NHL binder — may be added provided this is done before the optimal level of water is added and strictly in accordance with the supplier's instructions.

Hot lime mortars: Water is added to quicklime and dry aggregate (the quicklime is usually placed in a well in the sand) and thoroughly combined with a shovel, the slaking and mixing effectively taking place at the same time. The process generates a lot of heat, and the mixed mortar may have to be sieved to remove unslaked lumps or other impurities.

Pozzolans (additives): Do not add to mortar until immediately before use. Mix with water to form a slurry before thoroughly blending into binder–aggregate mixture (coarse stuff) using a plaster mixer drill or rotary drum mixer. POZZOLANS MUST NOT BE ADDED TO NHL MORTARS.

04.07 USAGE

Calcium lime mortars: can be stored and reworks ('knocked–up') provided isolated from contact with air, i.e. in sealed containers. MORTAR TO WHICH POZZOLANS HAVE BEEN ADDED MUST BE USED WITHIN TWO HOURS OF BLENDING.

NHL mortars: can be knocked–up within 12 hours of mixing, provided they are covered and protected to minimise water loss. Reworking should entail adding only the absolute minimum of water. If significant quantities of water are needed then the mortar must be discarded.

Hot lime mortars: can be used hot or cold, and stored as calcium lime mortars.

04.08 WORKING TEMPERATURE

Do not mix mortars unless precautions are taken to ensure that the air temperature *at time of placing* will be above 5°C and below 30°C, taking account of the wind chill factor on exposed sites. Cease work when the air temperature is at or below 5°C (or likely to fall below 5°C before the surface set of the mortar) unless precautions are taken to ensure that the mortar is 8°C min. when laid and is protected from freezing until the mortar has hardened. Do not place during a continuous cold spell.

04.09 GENERAL (FINAL) PROTECTION

Protect mortar from direct sunlight, wind and rain for at least one week after placing. In hot weather, prevent rapid drying out by wetting with a fine mist spray two or three times a day. Netting to scaffolding will provide adequate protection generally, though exposed work will need to be protected with plastic sheeting or similar in close contact.

05 REPOINTING

05.01 PURPOSE

The purpose of repointing selected joints and areas of the walling is to ensure that open bed joints or perpends which compromise the weathering function of the walls are filled with mortar which is more permeable than the adjacent masonry, and that — where practical and appropriate — damaging cement–rich pointing is replaced.

C.05: OPEN JOINTS & FAILING CEMENT MORTAR IN NEED OF RENEWAL

05.02 MORTAR ANALYSIS

Before finalising any decision to repoint, the nature and composition of the existing mortar should be established, and if necessary adjustments made to the mixes given in 04.04. Simple visual analysis of a sample using a 10x lens will usually suffice, though for important walls laboratory analysis of samples may be considered. Firms who are able to carry out analysis are listed in *The Building Conservation Directory* published annually by Cathedral Communications Ltd.

05.03 EARTH MORTARS AND DRY BEDDING

Some walls — particularly retaining walls — may be bedded in earth–lime mortar or just earth; if so, the walls should be repointed in a similar mortar, using where necessary local deposits of clay and accepting the need to experiment with samples and trials. Where stonework laid in earth mortars has been subsequently repointed, in cement, the pointing should be removed, noting that the repointing is quite likely to have failed or be failing. Other walls may simply be laid 'dry', in which case no attempt should be made to point any joints; previous attempts at pointing may also need to be removed.

05.04 REMOVAL OF EXISTING POINTING

Carefully cut out defective pointing, breaking hard cement mortar along the line of the joint with a flat bladed chisel or quirk held parallel to the joint, always working away from the arises of the stones, which must not be chipped. Softer mortars can be removed by hand using a small tool or — with careful use — a hammer and a

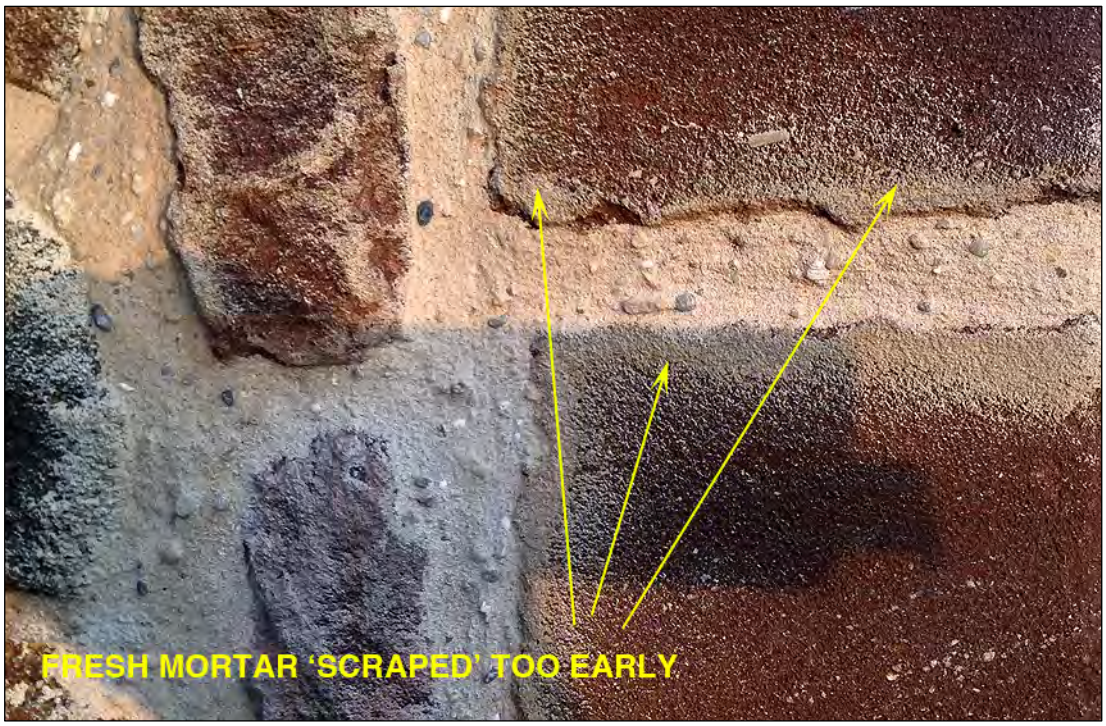
chisel or quirk which is *narrower* than the width of the joints being cleared. Mortar should be removed to a depth of 30mm from the arises of the masonry and cut back to a square, clean face. DO NOT USE ANGLE GRINDERS OR OTHER POWER TOOLS TO REMOVE MORTAR; ALL JOINTS MUST BE CLEARED BY HAND.

05.05 PREPARATION OF JOINTS

Fully clean open joints using a bristle brush and compressed air, and if necessary an industrial vacuum cleaner. Rinse debris from joints and wall surface using a hand sprayer with a fine jet until the water runs clear.

05.06 POINTING AND FINISHING

Dampen joints immediately prior to filling. Fill joints with mortar, pressing well (hard) into the back of the joint with a pointing iron of the correct size (i.e. narrower than the joint), bringing joints flush or slightly proud of the surface of the surrounding stone or brickwork ready for finishing. Protect as necessary until finishing. DO NOT ATTEMPT TO CLEAN FRESH, SURPLUS MORTAR FROM THE FACES OF THE STONEWORK.



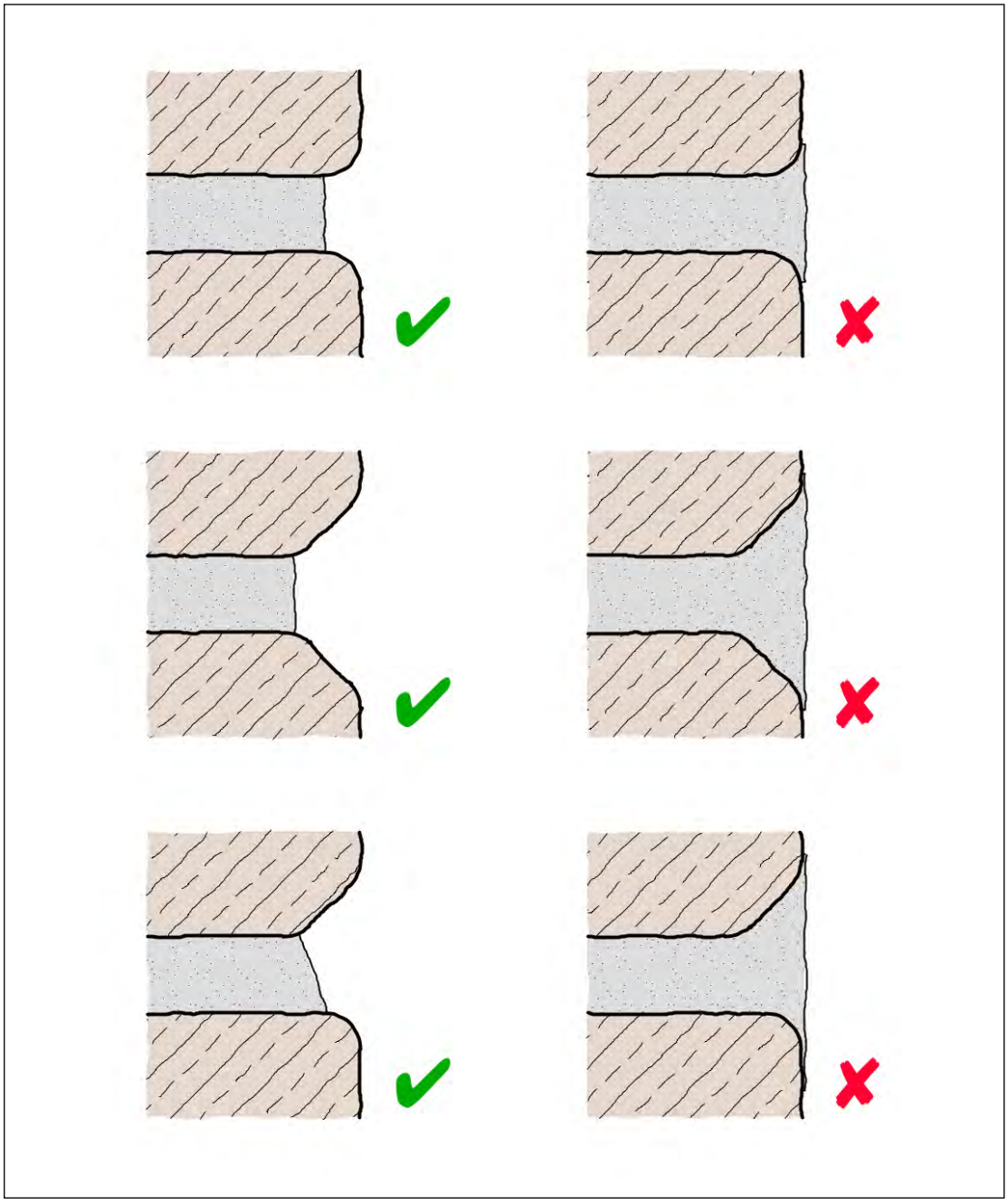
C.06: PERMANENT DISCOLOURATION OF STONEWORK DUE TO ATTEMPT TO REMOVE SURPLUS MORTAR WHILE PLACING (I.E. WHEN FRESH)

05.07 DEEP TAMPING

Where joints are deep or have voids behind which need packing out (e.g. after raking out friable mortar), it may be necessary to point–up in more than one application (to avoid slumping or excessive shrinkage), pushing a 'dry' mortar hard back into the joint with a tamping iron or other suitable tool. Build–up deep tamping in layers, allowing each application to dry (dewater) before applying more mortar.

05.08 FINISHING

Allow the mortar to go off. Tidy up and compact any loose or friable edges using a spatula or other fine tool, 'contouring' the mortar to ensure the avoidance of any vulnerable feathered edges, i.e. faces of joints to be at between 45° and 90° to the beds of the stonework. Stipple with a stiff bristle (churn) brush so as to break (open) the surface of the joint, which should finish flush or just back from the rounded or weathered arises of the masonry. SPONGING (SMOOTING) OF JOINTS AND RAISED (RIBBON) POINTING ARE IN NO CIRCUMSTANCES ACCEPTABLE.



C.07: CORRECRT & INCORRECT TREATMENT OF POINTED JOINTS

05.09 PROTECTION

Protect mortar — placed and finished — from direct sunlight, wind and rain using polythene sheet or hessian in close contact. In hot weather, prevent rapid drying out by wetting with a fine mist spray two or three times a day (if used, hessian to be kept damp regardless). If temperatures are expected to drop below 5°C at night, provide additional layers of insulation, e.g. bubble–wrap separated from the masonry by a layer of hessian, overlain by a second layer of hessian held firmly in place. Protection to remain in place for at least one week after finishing of mortar.

C.08: GOOD QUALITY REPOINTING OF A SQUARED RUBBLE WALL

06 INDENT (STONE REPLACEMENT) REPAIRS

06.01 PURPOSE

The purpose of indent repairs is to replace deeply eroded stones that threaten the stability or weathering function of a wall or structure using new (or reclaimed) stone that matches as closely the existing in terms of colour, texture, etc.

06.02 SEQUENCING

Cutting out of stones (individually or in groups) must be planned so as to ensure the stability of the structure is not compromised, taking account of both size and position of stone, with stonework renewed in short, discontinuous lengths. Allow if necessary for needling, propping and pinning.

06.03 CUTTING OUT EXISTING STONES

Cut out around each stone — or area of stone — to be replaced using a fine–toothed masonry saw or other tool that is narrower than the width of the surrounding joints, and to the full depth of the stone; coping stones to be cut out full depth and height. NO ANGLE GRINDERS OR OTHER POWER TOOLS ARE TO BE USED. The utmost care is to be taken to ensure that adjacent stones are not in any way damaged (e.g. chipped, nicked or cut). Stone to be wasted may be removed by any reasonable means following loosening.

06.04 PREPARATION OF CAVITY

Clear all dust and debris from the whole of the cavity by flushing with clean water, and allow to dry. If necessary, retain samples of mortar for analysis.

06.05 PREPARATION OF NEW STONES

Ensure all stones are dressed and sized to suite the cavity allowing for mortar joints to match existing width, and for the correct bedding of each stone, which should follow the pattern of the existing (unless already incorrectly bedded).

06.06 LAYING

Wet the existing stone and spread to the base and rear of the cavity a mortar bed of a thickness to suit the final joint width and the line of the face of the stonework (new stone). Dampen and carefully place the new stone, working it back into the cavity until it is in the correct position.

06.07 JOINTING AND POINTING

Allow for the bed joints to dry and the new stone to settle. Fill all remaining joints with mortar, deep tamping to ensure compaction right to the back of the joint before pointing and finishing in accordance with Section 05, noting the requirements for finishing and protection.

07 REBUILDING

07.01 PURPOSE

The purpose of rebuilding is — on the basis of understanding and justification (rebuilding should always be a last resort) to — carefully take down and reconstruct unstable or falling stonework, using as much original material as possible, following and where necessary recreating the existing pattern, coursing and detailing.

07.02 RECORDING

Before taking town, record in detail the wall or structure as it stands, assigning a unique number to each stone. Positions of stones in elevation (both sides of walls) can be recorded on marked–up, rectified photos or heavy gauge clear polythene held in a tracing frame. Pay special attention to unique or characterful details.

07.03 TAKING DOWN

Carefully take down masonry stone–by–stone, working sequentially from the coping or top course one layer of stone at a time, numbering the top of each stone with chalk prior to removal, and marking clearly both face and tail, i.e. the direction of the stone in the wall. Store stones in a systematic manner, laid out in sequence. Clear all stones of mortar, dust and debris.

07.04 REBUILDING

Wetting stonework as work proceeds, rebuild walling in the reverse sequence of taking down, working in horizontal layers (courses) placing each numbered stone back in its original location and in the correct orientation. Bed stones in lime mortar as Section 04, accounting for the possibility of earth mortars, etc. as 05.03. For walls, do not raise more than approximately 900mm of stonework in any day.

07.05 FINISHING

Leaving bedding mortar as laid for approximately 24 hours before removing surplus material and finishing as specified for repointing in 05.06.

07.06 PROTECTION

Cover rebuilt stonework at the end of each day, and provide on–going protection generally as for repointing (05.09), though allowing for the stonework being wetter and hence the possible need to remove protection earlier (to allow the free lime component of the mortar to dewater and carbonate).

08 RESTORATION & NEW WORK

Where stonework that has — for whatever reason — been lost and is on the basis of evidence and justification to be restored, new building should be on the basis of the specifications provided in Sections 03 to 07. Particular care should be taken to match the type of stonework (random or squared rubble, uncoursed or coursed, etc.) and the pattern and heights of any coursing, which may be:

- **Random:** Uncoursed, brought to courses, polygonal, diagonal or herringbone.
- **Squared:** Uncoursed, snecked, brought to courses or regularly coursed.

New walls and other minor structures (especially walls) should only be introduced in areas where sandstone contributes to local distinctiveness (refer Subsection 04.2 of main body of Sandstone Structures Audit report).

Local traditions in terms of usage, stone size and coursing should always be noted and generally followed.

C.09: RANDOM — UNCOURSED

C.10: RANDOM BROUGH TO COURSES

C.11: RANDOM — POLYGONAL

C.12: RANDOM — DIAGONAL

C.13: SQUARED — UNCOURSED

C.14: SQUARED — SNECKED

C.15: SQUARED BROUGHT TO COURSES

C.16: SQUARED — REGULAR COURSES

C.09–C.16: TYPES OF RUBBLE WALLING

09 OTHER REPAIRS

Individual circumstances may require other forms of repair to minor sandstone structures, examples of which include grouting, crack–stitching, buttressing, pinning and other engineering–type interventions. These must be justified and developed on a case–by–case basis, combined with a thorough understanding of the issues involved and if appropriate the advice of a structural engineer experienced in the conservation of historic buildings and structures.

10 FURTHER INFORMATION

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D POTENTIAL PROJECT COSTS

INTRODUCTION

Set out in this Appendix are further details and the build–up of **estimated** costs presented in section 06.4.1 of the main body of the Sandstone Structures report.

Using the same split and order — churchyard walls, unoccupied sandstone buildings at risk and significance sandstone walls at risk — each targeted project is identified (with national six figure grid reference, and listing and conservation area status) and described, along with outlines of the issues that need to be addressed and the works proposed.

The cost of each project is presented in the form of a table that shows:

- Each item of work assessed — on the basis of a brief cursory, visual inspection, non–invasive survey — as needed for its *conservative* repair.
- Where relevant, the rate and unit, i.e. cost per metre or square metre. Rates are based on information obtained from a building contractor experienced in stonework, the use of traditional materials and conservation of historic structures, supplemented by rates for similar work on real–life projects and typical prices (£42 per tonne or £25 per stone) for the supply of new stone obtained from the two quarries still able to supply building stone (refer 03.3.4 of the main body of the report and Appendix C).
- If applicable, the quantity of work assumed on the basis of the rough (paced–out) and estimated measurements of each structure.

The final costs of each item (in some cases a simple lump sum) are rounded to the nearest pound with the total rounded to the nearest £100. Contractors' profits, preliminaries (non–works costs such as scaffolding, skips, etc.) and overheads (office, transport, etc. costs) are added as a percentage, generally 30% though reduced to 20% on lager projects. Fees and charges are likewise allowed on the basis of services as would be typically expected of a conservation–accredited architect, building surveyor or structural engineer.

It should be noted that estimated costs are:

- **For the full value of the works, not just any grant aided element.**
- **Exclusive of VAT.**
- **Current as of November 2015.**
- **Exclusive of any contingency.**
- **Ballpark figures to be refined during the process of procuring works.**

THE OUTLINES OF WORK ARE INDICATIVE AND PROVIDED FOR GUIDANCE PURPOSES ONLY, AND MUST NOT BE USED AS A SPECIFICATION OR SCHEDULE OF WORKS.

01 WOBURN: OLD ST. MARYS

GRID REF: SP948332

Curtilage of Grade II* listed building in a Conservation Area.

Description

Low (dwarf) wall approximately 36 m long x 0.6 m high comprising 4–5 courses of coursed squared rubble on limestone base course with dressed limestone coping and 4 x limestone piers to gateway at southern end. Contiguous with adjacent school wall to the north.

Issues

Sporadic salt erosion to lower two courses + failing and damaging cement pointing.

Works

Renewal (piecing–in) of squared stone blocks to lower two courses of wall and renewal of cement pointing to wall fronting Bedford Street.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Piece–in individual stones (40 in 2 x courses)	47	no.	40	1,880
Repoint 100%	91	sq–m.	22	2,002
Point coping	8	m.	36	288
Cleaning + conservation of limestone piers	40	sq–m.	16	640
Allow work to school wall (5 x stones + repoint)	item			1,100
Profit + prelims + O/H @ 30%	item			1,773
Fees + charges @ 15%	item			1,152
TOTAL (ROUNDED)				**8,800**

02 TINGRITH: ST. NICHOLAS

Grid Ref: TL007324

Curtilage of Grade I listed building in a Conservation Area.

Description

Approximately 110 m long x 1.0 m high wall to east side of churchyard incorporating gate with piers to southern return, and retaining over roughly 50% of its height. Generally random rubble brought to rough courses though some masonry un–coursed. Stone on edge coping.

Issues

Open joints and failure of cement pointing. Penetrating ivy. 1.0–2.0 square meter of partial collapse, and missing stones including to coping. Recently reset coping stones too far apart.

Works

Repointing, removal of ivy, piecing–in missing stones, reinstatement of runs of missing coping, resetting of existing coping incorporating new stones and some rebuilding.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Ivy treatment + clearance	item			500
Take down + rebuild	330	m.	2	660
Piece–in individual stones	47	no.	10	470
Reinstate coping	99	m.	3	297
Lift + re–bed copings	57	m.	5	285
Repoint 80%	91	sq–m.	80	7,280
Repoint copings	20	m.	40	800
Profit + prelims + O/H @ 30%	item			3,088
Fees + charges @ 15%	item			2,007
TOTAL (ROUNDED)				**15,400**

03 STEPPINGLEY: ST. LAWRENCE

Grid Ref: TL011353

Curtilage of Grade II listed building in a Conservation Area.

Description

Approximately 70 m long x 0.9 m high wall with single gateway of generally regular coursed, roughly squared rubble with stone–on–edge coping.

Issues

Failed cement pointing and instances of salt erosion at low level (impervious asphalt pavement immediately alongside). Loose copings and some invasive ivy.

Works

Renew failed and failing pointing and some piecing–in of stonework, along with resetting of copings stones and control of vegetation.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Ivy treatment + clearance	item			250
Piece–in individual stones	47	no.	10	470
Lift + re–bed copings	57	m.	5	285
Repoint one side 70%	91	sq–m.	50	4,550
Repoint copings	20	m.	50	1,000
Profit + prelims + O/H @ 30%	item			1,967
Fees + charges @ 15%	item			1,278
TOTAL (ROUNDED)				**9,800**

04 MAULDEN: ST. MARY THE VIRGIN

Grid Ref: TL058380

Curtilage of Grade II* listed building in a Conservation Area.

Description

Wall to east side of churchyard approximately 35 m long x 1.0 m high reducing in height to north with slope of ground, part retaining and incorporating two gateways with piers. Regular coursed squares rubble (6–7 courses above ground) with stone–on–edge coping.

Issues

Extensive failure of cement pointing and bedding plus vertical cracking to northern corner with evidence of 'rust jacking' to bed joints either side of north gate. Some penetrating ivy.

Works

Some reduction in ground levels towards northern end, repointing, treatment (removal) of corroding iron, crack repair (stitching) and targeted control of ivy.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Ivy treatment + clearance	item			500
Reduce ground level	item			500
Piece–in individual stones	47	no.	10	470
Lift + re–bed copings	57	m.	20	1,140
Repoint copings	20	m.	35	700
Repoint 100%	91	sq–m.	35	3,185
Work to piers including iron removal	item			1,000
Profit + prelims + O/H @ 30%	item			2,249
Fees + charges @ 15%	item			1,462
TOTAL (ROUNDED)				**11,200**

05 FLITTON: ST. JOHN THE BAPTIST

Grid Ref: TL059358

Curtilage of Grade I listed building in a Conservation Area.

Description

Full retaining wall surrounding churchyard, approximately 130 m long x 1.0 m high. Random rubble brought to courses with squared rubble to piers of single gateway leading to steps. No coping, i.e. wall head exposed. Asphalt paving alongside north and east sides.

Issues

Some loose mortar (including feathered and hence failing lime mortar) with some cracking due to hard cement mortar pointing un able to accommodate thermal expansion. Some salt erosion of stones at low level.

Works

Partial renewal of cement and failed pointing to walls fronting High Street and Brook Lane, along with crack repair, limited piecing–in of eroded stones, and possibly need for localised stabilisation.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Piece–in individual stones	47	no.	10	470
Repoint 50%	91	sq–m.	65	5,915
Crack stitching and general stabilisation	item			600
Profit + prelims + O/H @ 30%	item			1,916
Fees + charges @ 15%	item			1,245
TOTAL (ROUNDED)				**10,100**

06 HAYNES ST. MARY THE VIRGIN

Grid Ref: TL081412

Curtilage of Grade II* listed building in a Conservation Area.

Description

Two walls: approximately 55 m long x 1.0 m high to east side of churchyard; approximately 14 m long x 1.0 m high to north side of churchyard. Both in part retaining. Longer wall is regular coursed squared rubble, shorter is squared rubble brought to courses. East–facing wall topped by a hedge. Trees in proximity to south facing wall. Stone on edge copings.

Issues

Extensive failure of lime pointing and bedding to north–facing wall. Some washed out joints to east–facing wall. A small number of individual stones eroded or fractured.

Works

Complete repointing and some piecing–in of stone to north–facing wall. Also a need for some piecing–in and filling of washed–out joints to east side of churchyard.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Piece–in individual stones	47	no.	10	470
Lift + re–bed copings	57	m.	5	285
Repoint 100%	91	sq–m.	69	6,279
Profit + prelims + O/H @ 30%	item			2,110
Fees + charges @ 15%	item			1,372
TOTAL (ROUNDED)				**10,500**

07 SUTTON: ALL SAINTS

Grid Ref: TL219475

Curtilage of Grade I listed building in a Conservation Area.

Description

Approximately 50 m long x 1.0 m high retaining wall to south side of churchyard (fronting Church Road) with a single gateway and continuing roughly 15 m east as a brick wall on a 0.5–0.9 m rubble sandstone base. Random rubble brought to courses with some stones roughly squared, including to gate piers. Limestone coping + cappings to piers.

Issues

Widespread failure of heavily–applied cement pointing.

Works

Extensive renewal of cement pointing.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Ivy treatment + clearance	item			500
Repoint 100%	91	sq–m.	50	4,550
Repoint copings	8	m.	50	400
Profit + prelims + O/H @ 30%	item			1,635
Fees + charges @ 15%	item			1,063
TOTAL (ROUNDED)				**8,100**

08 LITTLE BRICKHILL: BUTTERMILK FARM

Grid Refs: SP921319 & 922319

Unlisted buildings in hidden in woodland; minor contribution to landscape character.

Description

Ruined remains of historic farm grouping, now subsumed by woodland. Roofed, open sided animal or cart shelter (coursed, random rubble) plus standing remains of stable or cow house (squared rubble brought to courses with brick dressings). Also remains of farmhouse.

Issues

Walls to stable (or cow house) fractured and in part fallen with lack of roof exposing wall heads to rain penetration, etc. Extensive vegetation. Building at high risk of loss.

Works

Consolidation of ruins including clearance + management of vegetation, limited repointing and stone repairs, stabilisation of core and protection of wall heads (soft capping). Building needs to be made safe. Clearance and stabilisation of remnants of farmhouse (?) walls.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Ivy treatment + clearance	item			2,500
Consolidate wall heads	100	m.	40	4,000
Piece–in areas of stonework	300	sq–m.	6	1,800
Rebuild areas	340	sq–m.	10	3,400
Stabilise + tie structure	item			5,000
Repoint	91	sq–m.	30	2,730
Profit + prelims + O/H @ 30%	item			5,829
Fees + charges @ 20%	item			5,052
TOTAL (ROUNDED)				**30,300**

09 HEATH & REACH: BARN AT OVEREND GREEN

Grid Ref: SP933285

Unlisted building forming part of group; moderate contribution to landscape character.

Description

Part–roofed, unused and semi–derelict barn with standing remains of adjacent building attached, including approximately 1.5–1.8 m high wall to Overend Green Lane. Thin, random rubble stones brought to rough courses with brick dressings and buttresses.

Issues

Roadside wall extensively overgrown with penetrating ivy. Diagonal cracking to buttressed wall with exposed heads. Gaps in temporary roof leave wall heads of barn exposed.

Works

Stabilisation, repointing, new temporary roof, ivy and vegetation management, and protecting exposed wall heads; including remains of barn + wall on road.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Ivy treatment + clearance	item			4,000
Temp roof	item			3,000
Consolidate wall heads	100	m.	20	2,000
Piece–in areas of stonework	300	sq–m.	5	1,500
Rebuild areas	340	sq–m.	5	1,700
Crack stitch, etc.	item			4,000
Repoint	91	sq–m.	40	3,640
Profit + prelims + O/H @ 30%	item			5,952
Fees + charges @ 20%	item			5,158
TOTAL (ROUNDED)				**31,000**

10 MAULDEN: BUILDING IN CHURCHYARD

Grid Ref: TL058381

Curtilage of Grade II* listed building in a Conservation Area.

Description

Single storey building against north wall of churchyard. Asymmetric, plain tiled roof on walls of squared rubble brought to courses with single doorway with pointed arch head to east elevation. Historic usage not known.

Issues

Building is overgrown and ruinous with partial collapse of roof and north wall. Cracked and displaced masonry, and extensive ivy penetration.

Works

Clearing out, stabilisation of walls including part rebuilding of north wall, crack stitching and repointing; 100% renewal of roof + new gate to control access.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Vegetation management	item			500
Re–roof including structure	item			4,000
Piece–in individual stones	47	no.	10	470
Rebuild areas	340	sq–m.	2	680
Stabilise + tie structure	item			3,000
Repoint	91	sq–m.	20	1,820
Profit + prelims + O/H @ 30%	item			3,141
Fees + charges @ 20%	item			2,722
TOTAL (ROUNDED)				**16,300**

11 GREAT BRICKHILL: WALL TO MANOR PARK

Grid Ref: SP896307

Major contribution to landscape character & (undesignated) parkland.

Description

Approximately 230 m long x 2.0 m high walls running downhill to south side of parkland formerly associated with Great Brickhill (old) Manor (demolished). Continuation of brick wall and gateway uphill to the east. Coursed, random rubble approximately 450 mm of two skins with loose rubble core. Half round brick copings on single course of bricks.

Issues

Wall is leaning and in part fallen, exposing core to the elements. Loss of brick copings and extensive encroachment of penetrating ivy and other vegetation.

Works

Vegetation management, stabilisation, repair and partial restoration. Rebuilding of approx. 36 m of wall alongside footpath (Milton Keynes Boundary Walk).

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Clear + manage vegetation	item			1,000
Rebuild lengths full height off existing footing	672	m.	36	24,192
Reinstate coping	40	m.	10	400
Repoint coping (brick)	20	m.	20	400
Profit + prelims + O/H @ 20%	item			5,198
Fees + charges @ 15%	item			4,679
TOTAL (ROUNDED)				**34,900**

12 CLOPHILL: WALL TO 57A HIGH STREET

Grid Ref: TL087380

Positive contribution to character & appearance of Conservation Area.

Description

Approximately 8 m long x 1.1 m high wall of random and squared rubble brought to courses with brick on edge coping, and alongside asphalt paving.

Issues

Salt erosion to courses near base of wall. Approximately 5 m of wall demolished (reported to have fallen during works to create a parking area for previous owner) though footing survives beneath forward–leaning hedge.

Works

Renew eroded stonework to bottom 2–3 courses (up to 0.6 m) + full repointing. Reinstate (rebuild) missing length of wall off original footing.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Piece–in stonework (2–3 courses high)	180	m.	3	540
Repoint 100%	91	sq–m.	4	364
Repair coping (lift + repoint)	56	m.	3	168
Rebuild full height off existing footing	404	m.	5	2,020
Profit + prelims + O/H @ 30%	item			928
Fees + charges @ 15%	item			603
TOTAL (ROUNDED)				**4,600**

13 CLOPHILL: WALL TO 59 HIGH STREET

Grid Ref: TL087380

Positive contribution to character & appearance of Conservation Area.

Description

Approximately 25 m long x 1.1 m high wall of random and squared rubble brought to courses with brick on edge coping + course of Fletton bricks on top, and alongside asphalt paving.

Issues

Salt erosion to courses near base of wall. Extensive failure of cement pointing + decay to redundant upper course of brick coping.

Works

Renew eroded stonework to bottom 2–3 courses (up to 0.6 m) + full repointing. Remove course of Fletton brickwork from top of canted brick–on–edge coping, and fully repoint.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Piece–in stonework (2–3 courses high)	180	m.	25	4,500
Repoint 100%	91	sq–m.	30	2,730
Repair coping (remove Fletton course + repoint)	56	m.	25	1,400
Profit + prelims + O/H @ 30%	item			2,589
Fees + charges @ 15%	item			1,683
TOTAL (ROUNDED)				**12,900**

14 SANDY LODGE: WALL ON STRATFORD ROAD

Grid Ref: TL186476

Curtilage of Grade II listed building and a major contribution to landscape character.

Description

Approximately 350 m long x 1.0 m high portion of 2.8 km wall surrounding Sandy Warren incorporating gateway with piers (the Blue Gates) and gateway to east of Cottage Farm. Mix of random rubble and fully coursed, roughly squared rubble with stone on edge copings.

Issues

Wall is discontinuous due to areas of collapse. Extensive penetrating vegetation, including to piers of Blue Gates. Dropped capping to pier east of Cottage Farm + some areas of collapse.

Works

Vegetation control and repointing of wall adjacent Blue Gates. Rebuilding off existing footing using reclaimed and new stone of approx. 30 m of wall beyond, including repair of gate piers and pier east of Cottage farm (dropped capping) and adjacent stretch of walling.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Clear vegetation	item			1,000
Rebuild tops of piers (piece–in)	item			1,000
Rebuild (restore) 30 m length	330	m.	30	9,900
Repoint 20 m + piers	91	sq–m.	40	3,640
Reinstate capping to pier	item			500
Localised rebuild	404	m.	1	404
Profit + prelims + O/H @ 20%	item			4,609
Fees + charges @ 15%	item			4,148
TOTAL (ROUNDED)				**22,700**

15 POTTON: WALL TO 6 MARKET SQUARE

Grid Ref: TL223492

Curtilage of Grade II listed building in a Conservation Area.

Description

Approximately 22 m long x 1.0 m high wall alongside yard to rear of property. Panels of diagonally laid walling between brick piers with brick–on–edge on sailing course coping.

Issues

Missing (hollow) areas of walling threaten stability + decayed or missing brick coping.

Works

Stabilisation: piecing–in or rebuilding fallen (hollow) areas, repairs to coping, repointing, etc.

Estimated cost

ITEM	RATE (£)	UNIT	QUANT.	COST (£)
Piece–in stonework in 0.5 m x 0.5 m areas	120	no.	4	480
Repoint 50% both sides	91	sq–m.	22	2,002
Repair brick coping	40	m.	22	880
Rebuild	404	m.	2	808
New coping	100	m.	2	200
Prelims @ 30%	item			1,311
Fees + charges @ 15%	item			852
TOTAL (ROUNDED)				**6,500**

E HEALTH & SAFETY

INDG411 NEED BUILDING WORK DONE? A SHORT GUIDE FOR CLIENTS ON THE CONSTRUCTION (DESIGN & MANAGEMENT) REGULATIONS 2015

CONSTRUCTION INFORMATION SHEET 36: SILICA

INDF463 CONTROL OF EXPOSURE TO SILICA DUST

ST0 COSSH ESSENTIALS FOR STONEMASONS: SILICA ADVICE FOR MANAGERS

ST1 COSSH ESSENTIALS FOR STONEMASONS: SILICA PRIMARY AND SECONDARY SAWING

ST2 COSSH ESSENTIALS FOR STONEMASONS: SILICA ROTARY TOOLS: BORING AND POLISING

ST3 COSSH ESSENTIALS FOR STONEMASONS: SILICA HAND-HELD ROTARY TOOLS: CUTTING AND POLISHING

ST4 COSSH ESSENTIALS FOR STONEMASONS: SILICA HAND AND PNEUMATIC CHISELLINGP

Need building work done?

A short guide for clients on the Construction (Design and Management) Regulations 2015

This is a web-friendly version of leaflet INDG411(rev1), published 04/15

This leaflet is aimed at you if you are a building owner, user or managing agent and are having maintenance, small-scale building work or other minor works carried out in connection with a business – as you will be a client with legal duties under the Construction (Design and Management) Regulations 2015 (CDM 2015).

Following the simple steps in this leaflet will help you meet your responsibilities as a client and ensure construction work and repairs are undertaken safely and without damaging worker's and other people's health.

What does CDM 2015 do?

Complying with CDM 2015 will help ensure that no-one is harmed during the work, and that your building is safe to use and maintain while giving you good value. Effective planning will also help ensure that your work is well managed with fewer unexpected costs and problems.

What do clients need to do?

Many clients, particularly those who only occasionally have construction work done, are not experts in construction work. Although you are not expected to actively manage or supervise the work yourself, you have a big influence over the way the work is carried out. Whatever the size of your project, you decide which designer and contractor will carry out the work and how much money, time and resource is available. The decisions you make have an impact on the health, safety and welfare of workers and others affected by the work.

CDM 2015 is not about creating unnecessary and unhelpful processes and paperwork. It is about choosing the right team and helping them to work together to ensure health and safety.

As a client, you need to do the following.

1 Appoint the right people at the right time

If more than one contractor will be involved, you will need to appoint (in writing) a principal designer and a principal contractor.

A principal designer is required to plan, manage and coordinate the planning and design work. Appoint them as early as possible so they can help you gather information about the project and ensure that the designers have done all they can to check that it can be built safely.

A principal contractor is required to plan, manage and coordinate the construction work. Appoint them as early as possible so they are involved in discussions with the principal designer about the work.

Getting the right people for the right job means your designers and your contractors need to have the skills, knowledge and experience to identify, reduce and manage health and safety risks. This is also the case if they are a company (known as having 'organisational capability' for the job). The designers and the contractors should be able to give references from previous clients for similar work and explain to you how they will achieve this.

Professional bodies can help you choose your architect and other designers. The Safety Schemes in Procurement (SSIP) website has lists of businesses which have been assessed on their health and safety management. A contractor may be a member of a trade association.

2 Ensure there are arrangements in place for managing and organising the project

The work is more likely to be done without harming anyone and on time if it is properly planned and managed. Sometimes the work is complex and uses many different trades. Often it involves high-risk work such as the work listed in the bulleted list below. The principal designer should understand these types of risks and try to avoid them when designing your project. The principal contractor or builder should manage the risks on site.

These are the biggest causes of accidents and ill health in construction work, and your designer and contractor can manage the risks by doing the following.

- Falls from height:
  - Make sure ladders are in good condition, at a 1:4 angle and tied or footed.
  - Prevent people and materials falling from roofs, gable ends, working platforms and open edges using guardrails, midrails and toeboards.
  - Make sure fragile roof surfaces are covered, or secure working platforms with guard rails are used on or below the roof.
- Collapse of excavations:
  - Shore excavations; cover or barrier excavations to prevent people or vehicles from falling in.
- Collapse of structures:
  - Support structures (such as walls, beams, chimney breasts and roofs) with props; ensure props are installed by a competent person.
- Exposure to building dusts:
  - Prevent dust by using wet cutting and vacuum extraction on tools; use a vacuum cleaner rather than sweeping; use a suitable, well-fitting mask.
- Exposure to asbestos:
  - Do not start work if it is suspected that asbestos may be present until a demolition/refurbishment survey has been carried out.
- Electricity:
  - Turn the electricity supply and other services off before drilling into walls.
  - Do not use excavators or power tools near suspected buried services.
- Protect members of the public, the client, and others:
  - Secure the site; net scaffolds and use rubbish chutes.

Discuss with your designer and builder before work starts and throughout the build how these risks are being managed.

3 Allow adequate time

Work that is rushed is likely to be unsafe and of poor quality. Allow enough time for the design, planning and construction work to be undertaken properly.

4 Provide information to your designer and contractor

Your designer and builder will need information about what you want built, the site and existing structures or hazards that may be present such as asbestos, overhead cables, and buried services. Providing this information at an early stage will help them to plan, budget and work around problems. Your principal designer can help you gather this information.

Putting together a 'client brief' at the earliest stages which includes as much information as you have about the project, along with the timescales and budget for the build and how you expect the project to be managed can help you to set the standards for managing health and safety.

5 Communicate with your designer and building contractor

Your project will only run efficiently if everyone involved in the work communicates, cooperates and coordinates with each other.

During the design and planning stage, you, your designer and contractor need to discuss issues affecting what will be built, how it will be built, how it will be used and how it will be maintained when finished. This will avoid people being harmed or having unexpected costs because issues were not considered when design changes could still easily be made.

Meeting with your designer and contractor as the work progresses gives an opportunity to deal with problems that may arise and discuss health and safety. This will help to ensure that the work progresses as planned.

6 Ensure adequate welfare facilities on site

Make sure that your contractor has made arrangements for adequate welfare facilities for their workers before the work starts. See the HSE publication *Provision of welfare facilities during construction work* (see 'Further reading').

7 Ensure a construction phase plan is in place

The principal contractor (or contractor if there is only one contractor) has to draw up a plan explaining how health and safety risks will be managed. This should be proportionate to the scale of the work and associated risks and you should not allow work to start on site until there is a plan.

8 Keep the health and safety file

At the end of the build the principal designer should give you a health and safety file. If the principal designer leaves before the end of the project, the principal contractor (or contractor if there is only one contractor) should do this. It is a record of useful information which will help you manage health and safety risks during any future maintenance, repair, construction work or demolition. You should keep the file, make it available to anyone who needs to alter or maintain the building, and update it if circumstances change.

9 Protecting members of the public, including your employees

If you are an employer, or you have members of the public visiting your premises, you need to be sure that they are protected from the risks of construction work.

Discuss with your designer and contractor how the construction work may affect how you run your business, eg you may have to re-route pedestrian access; make sure signs to your entrance are clear; or change the way your deliveries operate.

10 Ensure workplaces are designed correctly

If your project is for a new workplace or alterations to an existing workplace (eg a factory or office), it must meet the standards set out in the Workplace (Health, Safety and Welfare) Regulations 1992 (see 'Further reading').

Notifying construction projects

For some construction work (work lasting longer than 30 days with more than 20 workers working at the same time, or involving 500 person days of work), you need to notify HSE of the project as soon as possible before construction work starts. In practice, you may request someone else to do this on your behalf.

How can you find out more?

Your principal designer or principal contractor will be able to advise you on your duties.

Why you should comply with your duties as a client

If you do not comply with CDM 2015, you are likely to be failing to influence the management of health and safety on your project. This means that your project could be putting workers and others at risk of harm, and that the finished structure may not achieve good standards and be value for money.

If you don't appoint a principal designer or principal contractor you will be responsible for the things that they should have done.

Serious breaches of health and safety legislation on your construction project could result in construction work being stopped by HSE or your local authority and additional work may be needed to put things right. In the most serious circumstances, you could be prosecuted.

Fee for Intervention

HSE now recovers the costs of time spent dealing with material breaches of health and safety law. This is known as Fee for Intervention (FFI). FFI applies when an inspector finds something wrong that they believe is serious enough for them to write to you about. A fee is charged for the time spent by the inspector in sorting it out. Following the simple guidance in this leaflet may help you to avoid having to pay a fee.

Domestic clients

If you are having work done on your own home, or the home of a family member, and it is **not** in connection with a business, you will be a domestic client. The only responsibility a domestic client has under CDM 2015 is to appoint a principal designer and a principal contractor when there is more than one contractor. However, if you do not do this, (as is common practice) your duties as a domestic client are automatically transferred to the contractor or principal contractor. If you already have a relationship with your designer before the work starts, the designer can take on your duties, provided there is a written agreement between you and the designer to do so.

Further reading

CONIAC industry guides www.citb.co.uk/health-safety-and-other-topics/health-safety/construction-design-and-management-regulations/cdm-guidance-documents

Construction phase plan (CDM 2015): What you need to know as a busy builder Construction Information Sheet CIS80 HSE Books 2015 www.hse.gov.uk/pubns/cis80.htm

Health and safety in construction HSG150 (Third edition) HSE Books 2006 ISBN 978 0 7176 6182 4 www.hse.gov.uk/pubns/books/hsg150.htm

Managing health and safety in construction. Construction (Design and Management) Regulations 2015. Guidance on regulations L153 HSE Books 2015 ISBN 978 0 7176 6626 3 www.hse.gov.uk/pubns/books/l153.htm

Provision of welfare facilities during construction work Construction Information Sheet CIS59 HSE Books 2010 www.hse.gov.uk/pubns/cis59.htm

Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice and guidance L24 (Second edition) HSE Books 2013 ISBN 978 0 7176 6583 9 www.hse.gov.uk/pubns/books/l24.htm

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This leaflet is available at: www.hse.gov.uk/pubns/indg411.htm.

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:

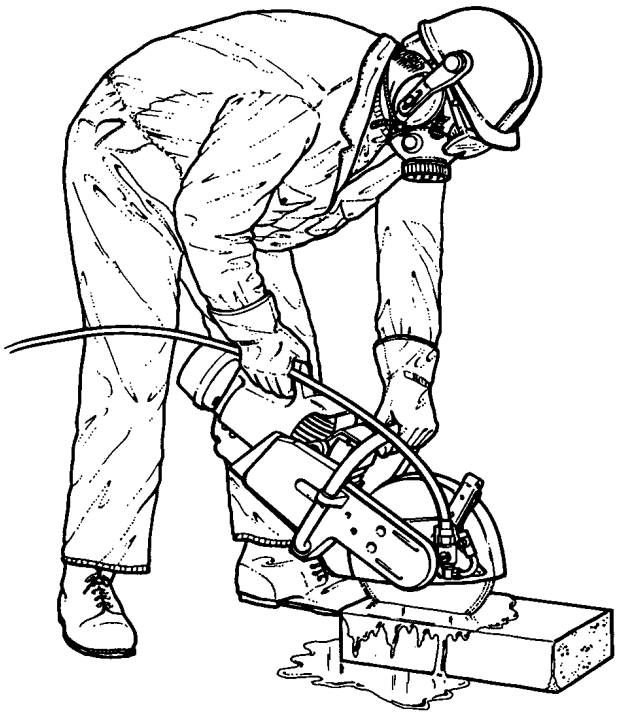
- stone masonry;
- facade renovation;
- blast cleaning of buildings, especially using sand;
- many demolition processes;
- concrete scabbling, cutting or drilling;
- tunnelling.

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

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 and free leaflets can be downloaded from HSE's website: www.hse.gov.uk.)

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.

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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Control of exposure to silica dust

A guide for employees

This is a web-friendly version of leaflet INDG463, published 03/13

This leaflet explains what your employer and you should do to prevent lung disease caused by exposure to silica at work.

What is silica?

Silica is a natural substance found in most rocks, sand and clay and in products such as bricks and concrete. Silica is also used as filler in some plastics. In the workplace these materials create dust when they are cut, sanded, carved etc. Some of this dust may be fine enough to breathe deeply into your lungs and cause harm to your health. The fine dust is called respirable crystalline silica (RCS) and is too fine to see with normal lighting.

The quantity of silica contained in stone and other materials varies considerably between different types of stone:

Approximate crystalline silica content of different materials	
Sandstone	70–90%
Concrete, mortar	25–70%
Tile	30–45%
Granite	20–45%, typically 30%
Slate	20–40%
Brick	Up to 30%
Limestone	2%
Marble	2%

Occupational exposure to RCS can occur in many industries, including:

- construction and demolition processes – concrete, stone, brick, mortar;
- quarrying;
- slate mining and slate processing;
- potteries, ceramics, ceramic glaze manufacture, brick and tile manufacture;
- foundries;
- refractory production and cutting;
- concrete product manufacture;
- monumental and architectural masonry manufacture, stone fireplace and kitchen worktop manufacture;
- grit and abrasive blasting, particularly on sandstone.

Certain activities create dust containing RCS, such as:

- grinding, drilling, cutting, sanding, chiselling, blasting;
- polishing, conveying;
- fettling;
- mixing and handling, shovelling dry material;
- rock drilling/breaking/crushing/screening.

In workplaces, the following can happen:

- leaks or spillages cause a build-up of dust containing RCS;
- dust containing RCS is not cleaned up safely, eg by dry sweeping rather than wet cleaning (see below);
- clothing and surfaces are contaminated with dust containing RCS;
- accumulated dust containing RCS is 'raised' from the ground or other surfaces by moving vehicles and people;
- fine dusts remain in the air from work activities.

How can RCS harm your health?

By breathing in RCS, you could develop the following lung diseases:

Silicosis: Silicosis makes breathing more difficult and increases the risk of lung infections. Silicosis usually follows exposure to RCS over many years, but extremely high exposures can lead rapidly to ill health.

Chronic obstructive pulmonary disease (COPD): COPD is a group of lung diseases, including bronchitis and emphysema, resulting in severe breathlessness, prolonged coughing and chronic disability. It may be caused by breathing in any fine dusts, including RCS. It can be very disabling and is a leading cause of death. Cigarette smoking can make it worse.

Lung cancer: Heavy and prolonged exposure to RCS can cause lung cancer. When someone already has silicosis, there is an increased risk of lung cancer.

The health risks from RCS are insignificant when exposure to dust is adequately controlled – you do not need to become ill through work activities.

What should your employer do to protect you?

Employers must comply with The Control of Substances Hazardous to Health Regulations 2002 (COSHH) (as amended) and need to:

- assess the risks to your health – this is called a 'risk assessment';
- keep a written record of the risk assessment if they employ more than five people;
- tell you anything significant about the risk assessment;
- consider where practicable substituting material with a lower RCS content;
- prevent or control exposures to RCS by:
  - following good occupational hygiene practice to achieve adequate control of exposure – more advice can be found in HSE's COSHH essentials (see 'Find out more');
  - for RCS, control measures must be effective in keeping exposure below the Workplace Exposure Limit (WEL) (0.1 mg/m^3 respirable dust, averaged over 8 hours);

- where necessary, provide you with personal protective equipment;
- maintain all equipment used as control measures in good working order;
- instruct and train you to use equipment properly, and tell you about health risks;
- monitor to ensure that controls are effective and that the WEL for RCS is not exceeded, (this may include measurement of the dust levels in your work area);
- where appropriate arrange health surveillance.

What should you do?

Your employer must tell you about the risks from RCS, and how to avoid them. Make sure you understand what you have to do and do it.

You should:

- ask if the material you are using, or dust from the work you are doing, contains silica;
- ask how the job should be done safely, without creating risks to your health;
- follow all safe working procedures, including cleaning procedure;
- use controls such as dust extraction as you were trained to do;
- wear protective clothing properly.

If you have to wear a respirator, make sure that:

- you are wearing the right type of respirator for the job;
- you have a face-fit test for a tight-fitting respirator, to ensure it fits properly – **you need to be clean shaven for this tight fit type of respirator to work effectively**;
- you have been trained to use, check and clean the respirator;
- the filters or disposable respirators are changed regularly;
- the equipment is stored in a clean, dust-free place;
- you tell your supervisor or employer if you find any defects, or your respirator does not fit, is dirty or its filter is old – your employer must put it right.

Do not:

- dry sweep – use vacuum or wet cleaning;
- use compressed air for removing dust from clothing.

If the controls to protect you from dust exposure include dust extraction (local exhaust ventilation (LEV)) or other engineering control equipment, you should ask yourself the following questions:

- Were you involved in the design and selection of control equipment – the way you work may need to change to maximise the protection you get?
- Are the proposed changes workable – if they are not you could suggest alternatives; the way you work may need to change to maximise the protection you get?
- Have you been trained in how the control equipment works – you need to know how to use it effectively, your employer, the equipment supplier or some other competent person should do this?
- Can you tell if the control equipment is not working effectively – you should be trained to recognise the signs, eg dust extraction equipment should have an airflow indicator to show that it is working properly?
- Is the control equipment easy to use properly – if it forces you to work in an awkward way or prevents you doing the task properly tell your employer and suggest improvements?

Your employer may also need to arrange for you to be placed under health surveillance. This may include:

- health and working history questionnaires;
- lung function tests;
- chest X-rays (these will only be undertaken if the doctor feels they are necessary).

Decisions on the appropriate form of health surveillance may require the advice of an occupational health professional. The precise form of health surveillance will depend on the particular circumstances of exposure (level, frequency and duration) identified by the risk assessment.

You should co-operate with your employer or works doctor/nurse if health surveillance is required.

You are not entitled to see someone else's personal medical records and your employer is not entitled to see yours. But the staff representative or union official can be given an idea of the workforce's overall ill health effects.

If you have concerns about working with RCS after talking to you employer, ask your trade union or employee health and safety representative for help, or speak to the doctor/nurse involved in the health surveillance.

Find out more

To protect employees and others, employers should comply with the workplace health and safety requirements in the Control of Substances Hazardous to Health Regulations 2002 (COSHH). HSE has produced simple *COSHH essentials* guidance sheets on how to control RCS exposure:

Brick and tile making series
www.hse.gov.uk/pubns/guidance/bkseries.htm

Ceramics series
www.hse.gov.uk/pubns/guidance/crseries.htm

Construction series
www.hse.gov.uk/pubns/guidance/cnseries.htm

Foundries series
www.hse.gov.uk/pubns/guidance/fdseries.htm

Manufacturing series
www.hse.gov.uk/pubns/guidance/mnseries.htm

Quarries series
www.hse.gov.uk/pubns/guidance/qyseries.htm

Slate works series
www.hse.gov.uk/pubns/guidance/slseries.htm

Stonemasons series
www.hse.gov.uk/pubns/guidance/stseries.htm

Health surveillance series
www.hse.gov.uk/pubns/guidance/g404.pdf

Respiratory protective equipment series
www.hse.gov.uk/pubns/guidance/rseries.htm

You can find out more about health surveillance at
www.hse.gov.uk/coshh/basics/surveillance.htm

Using cut-off saws: A guide to protecting your lungs Leaflet INDG461 HSE and The Highways Agency 2012 www.hse.gov.uk/pubns/indg461.htm

Further information

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This leaflet is available at www.hse.gov.uk/pubns/indg463.htm.

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ST0

Advice for managers

COSHH essentials for stonemasons: Silica

This information will help managers comply with the Control of Substances Hazardous to Health Regulations 2002 (COSHH), as amended, to control exposure to respirable crystalline silica (RCS) and protect workers' health.

It is also useful for trade union safety representatives.

This sheet describes good practice for controlling exposure to silica.

Introduction

What is silica, where is it found?

Many types of stone contain silica, and produce silica dust known as Respirable Crystalline Silica (RCS). RCS is also known as respirable α-quartz, cristobalite, or 'free silica'.

Crystalline silica concentrations in common materials

sandstone, gritstone, quartzite	more than 70%
concrete, mortar	25% to 70%
shale	40% to 60%
china stone	up to 50%
slate	up to 40%
brick	up to 30%
granite	up to 30%
ironstone	up to 15%
basalt, dolerite	up to 5%
limestone, chalk, marble	up to 2% (but these can contain silica layers)

This is one in a series of advice sheets for stonemasons

ST1 Primary and secondary sawing
ST2 Rotary tools: Boring and polishing
ST3 Hand-held rotary tools: Cutting and polishing
ST4 Hand and pneumatic chiselling

The risks

Inhaling RCS can lead to silicosis. Silicosis is a serious and irreversible lung disease that causes permanent disablement and early death, and it is made worse by smoking.

All RCS is hazardous. 'Respirable' means that the dust is invisibly fine, and gets deep into the lungs.

Action

You need to find out how much silica your workers are being exposed to. If you are unsure, you need to arrange for exposure measurements. See sheet G409.

Then you need to minimise the amount of RCS being breathed-in by reducing the amount of airborne dust. Look carefully at the control measures that can be used, some are more cost effective and practical for each situation than others.

Before acting, make sure the advice really fits your situation. Following all the advice in these sheets (and this may include respiratory protection as part of the integrated set of controls) means that you will normally comply with workplace exposure limits (WELs). Read the advice in each of the sheet(s) you downloaded. Compare it with what you do now.

You may already have the right controls in place, but are they all working properly? When were they last checked? Are they always used when needed? Is the RCS exposure controlled?

You need to keep all controls in good working order. This means mechanical controls (eg extraction, respirator), administrative controls (eg supervision, health surveillance) and operator behaviour (following instructions). Look at all aspects of the advice, don't pick and choose. The points work together to provide 'adequate control'. See sheet G406 for advice on engineering controls.

Show that control is being sustained – keep good records.
You need to carry out health surveillance for workers. See sheet G404.

If you are in doubt, seek expert help. Remember, just because this advice means that you have to change old working practices or spend money on new controls, that doesn't make it unsuitable! Decide how best to make any changes required 'across the board'.

If you do need expert help, please don't give up. Ask your trade association, trade union, or log onto www.bohs.org.

Procedures

Can you use stone containing less silica?

Wet working is extremely cost-effective and should be standard practice - especially for 'high energy' cutting.

Facilities

Provide clean facilities: a washroom, showers, storage for clean and contaminated work clothing, and a refreshment area.

Information, training and supervision

Tell workers:

- that stone dust can cause silicosis, which leads to disablement and early death;
- to avoid breathing in dust;
- to do the job in the correct way and minimise dust clouds;
- to always use the dust suppression and extraction equipment properly;
- to keep this equipment clean and working properly;
- if equipment is not working - report it;
- to keep their protective equipment clean, and wear it properly;
- to keep surfaces clean as this helps to prevent dust being made airborne again;
- to wash dust off skin
- to avoid cotton or knitted clothing; and
- to vacuum clean, not sweep.

Train and supervise workers - you need to make sure they are doing the job in the right way, and using controls properly to reduce their exposure. Include supervisors and managers in health and safety training.

Training should include:

- how to use the dust controls and how to check that they are working;
- how to maintain and clean equipment safely;
- how to use and look after personal protective equipment (PPE); and
- what to do if something goes wrong.

Remind workers that cotton or knitted work clothes hold dust that can be inhaled later.

Supervision means checking workers:

- use the controls provided;
- follow the correct work method;
- turn up for health surveillance; and
- are following the rules on personal hygiene.

Contractors also need supervision. Find out if they are bringing hazardous substances on site, and how they will protect your workers from them.

Environmental guidelines

Releases and wastes may be regulated within the Pollution Prevention and Control (PPC) framework. You should consult your local authority or the Environment Agency.

In Scotland, consult the Scottish Environment Protection Agency (SEPA). For more information, see www.netregs.gov.uk/netregs.

Further information

- *Controlling exposure to stonemasonry dust: Guidance for employers* HSG201 HSE Books 2001 ISBN 0 7176 1760 2
- *Stone dust and you: Guidance for stonemasons* Leaflet INDG315 HSE Books 2001 (single copy free)

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

Published by the Health and Safety Executive 10/06

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ST1

Primary and secondary sawing

COSHH essentials for stonemasons: Silica

This information will help employers (including the self-employed) comply with the Control of Substances Hazardous to Health Regulations 2002 (COSHH), as amended, to control exposure to respirable crystalline silica (RCS) and protect workers' health.

It is also useful for trade union safety representatives.

This sheet describes good practice using engineering control - water suppression and good general ventilation.

It covers the points you need to follow to reduce exposure to an adequate level.

It is important to follow all the points, or use equally effective measures.

Main points

- **High dust levels can result from stone sawing.**
- **Breathing in dust may cause silicosis.**
- **Keep exposure as low as possible using all the controls in this sheet. Make sure the controls work.**
- **You need air sampling. See sheet G409.**
- **Health surveillance is usually needed. See sheet G404.**

Control approach 2 Engineering control

Hazard

- ✓ Stonemasonry can produce airborne respirable crystalline silica (RCS).
- ✓ All RCS is hazardous, causing silicosis. This is a serious lung disease causing permanent disability and early death.
- ✓ Silicosis is made worse by smoking.
- ✓ 'Respirable' means that the dust can get to the deepest parts of the lung. Such fine dust is invisible under normal lighting.
- ✓ Keep inhalation of RCS as low as possible.
- ✓ When all controls are applied properly, less than 0.1 mg/m^3 RCS is usually achievable (based on an 8-hour time-weighted average).

Crystalline silica concentrations in common materials

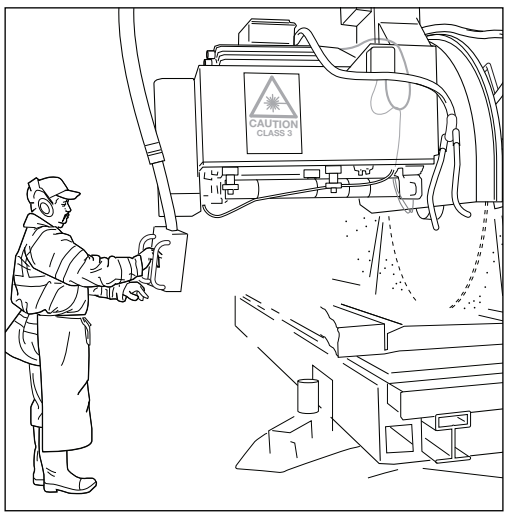
- ✓ See table in sheet ST0.

Access and premises

- ✓ Isolate machinery so that dust doesn't affect other workers.
- ✓ Where possible, use CCTV to monitor the process and reduce the need for people to be there.
- ✓ Locate the controls away from the machinery.
- ✓ Floors should slope gently towards gulleys, to help dust removal by wet washing.

Equipment

- ✓ Can you reduce dust by using thinner-bladed and slower-moving reciprocating saws in place of a circular saw?
- ✓ Can you use diamond-coated wire for cutting?
- ✓ Remember, although water-suppression is effective, mist still contains fine dust particles, so position spray baffles inside the guard to catch the water jet from the cutting channel.



Procedures

- ✓ Check that there is adequate water for dust suppression.

Maintenance, examination and testing

- ✓ Minerals and silica-containing dusts are very abrasive. Plan regular maintenance.
- ✓ Follow the instructions in the manual - keep equipment in effective and efficient working order.
- ✓ Clean down the equipment before starting maintenance - use wet or dustless methods.
- ✓ Spray baffles wear out quickly. They need frequent replacement.
- ✓ Make sure the water suppression is positioned and used correctly; repair any faulty equipment immediately.
- ✓ Maintain all respiratory protective equipment (RPE) in effective, clean and efficient working order.
- ✓ Daily, look for signs of damage.
- ✓ At least once a week, check that water suppression works properly.
- ✓ Check that the spray suppression (guard baffles, water jet interceptor) is in good condition.
- ✓ Get a competent ventilation engineer to examine the system thoroughly and test its performance regularly.
- ✓ Keep records of all examinations and tests for at least five years.
- ✓ Review records - failure patterns show where preventive maintenance is needed.
- ✓ Carry out air sampling to check that the controls are working well. See sheet G409.

Personal protective equipment (PPE)

- ✓ Ask your supplier to help you select the right PPE.
- ✓ Provide storage for clean and contaminated PPE.

Respiratory protective equipment (RPE)

- ✓ RPE may be needed for work near the equipment while it is running.
- ✓ Select RPE that suits the wearer, the job and the work environment. Powered or air-fed RPE is more comfortable to wear.
- ✓ Decide the level of protection from air sampling data. Otherwise, use RPE with a UK standard assigned protection factor (APF) of at least 20. See sheet R3.
- ✓ Disposable RPE is acceptable.
- ✓ Make sure all RPE is properly fit-tested - get advice from your supplier.
- ✓ Make sure that workers check their RPE works properly before use.
- ✓ Replace RPE filters as recommended by the supplier. Throw away disposable RPE at the end of the job or the end of the shift.
- ✓ Keep RPE clean and store it away from dust.

Other protective equipment

- ✓ Workers also need coveralls, eye and face protection, hearing protection, a hard hat (worn correctly), and protective gloves and footwear.
- ✓ Provide clean, dust-resistant (eg paper or nylon) coveralls.
- ✓ Skin creams help in washing contamination from the skin. After-work creams help to replace skin oils.

Caution: Never allow use of compressed air for removing dust from clothing.

Health surveillance

✓ You need health surveillance unless exposure to RCS is well below the limit. See sheet G404.

✓ Consult an occupational health professional - see 'Useful links'.

Cleaning and housekeeping

✓ Wash down the workroom at the end of each day's work and clear up sludge.

Training and supervision

✓ Tell workers that silica dust can cause serious lung diseases.

✓ Working in the right way and using the controls correctly is important for exposure control. Train and supervise workers. See sheet ST0.

Further information

- *Respiratory protective equipment at work: A practical guide* HSG53 (Third edition) HSE Books 2005 ISBN 0 7176 2904 X
- *Controlling exposure to stonemasonry dust: Guidance for employers* HSG201 HSE Books 2001 ISBN 0 7176 1760 2
- For environmental guidelines see sheet ST0

Useful links

- The Stone Federation may advise on health and safety consultants and training providers. Website: www.stone-federationgb.org.uk.
- For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.
- Contact the British Occupational Hygiene Society (BOHS) on 01332 298101 or at www.bohs.org for lists of qualified hygienists who can help you.
- Look in the Yellow Pages under 'Health and safety consultants' and 'Health authorities and services' for 'occupational health'.
- Also see www.nhsplus.nhs.uk.

This document is available at: www.hse.gov.uk/pubns/guidance/ and www.hse.gov.uk/coshh/essentials/

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

Employee checklist

☐ **Are you sure how to use all dust controls?**

☐ **Is the equipment switched off and locked off for maintenance and cleaning?**

☐ **Is the equipment in good condition and working properly?**

☐ **Is the water suppression working?**

☐ **Look for signs of leaks, wear and damage every day.**

☐ **If you find any problems, tell your supervisor. Don't just carry on working.**

☐ **Make suggestions to improve the effectiveness of dust control.**

☐ **Co-operate with health surveillance.**

☐ **Use, maintain and store your protective equipment in accordance with instructions.**

☐ **Use skin creams provided as instructed.**

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ST2

Rotary tools: Boring and polishing

COSHH essentials for stonemasons: Silica

This information will help employers (including the self-employed) comply with the Control of Substances Hazardous to Health Regulations 2002 (COSHH), as amended, to control exposure to respirable crystalline silica (RCS) and protect workers' health.

It is also useful for trade union safety representatives.

This sheet describes good practice using engineering control - water suppression and good general ventilation.

It covers the points you need to follow to reduce exposure to an adequate level.

It is important to follow all the points, or use equally effective measures.

Main points

- **High dust levels can result from stone boring and polishing.**
- **Breathing in dust may cause silicosis.**
- **Keep exposure as low as possible using all the controls in this sheet. Make sure the controls work.**
- **You need air sampling. See sheet G409.**
- **Health surveillance is usually needed. See sheet G404.**

Control approach 2 Engineering control

Hazard

- ✓ Stonemasonry can produce airborne respirable crystalline silica (RCS).
- ✓ All RCS is hazardous, causing silicosis. This is a serious lung disease causing permanent disability and early death.
- ✓ Silicosis is made worse by smoking.
- ✓ 'Respirable' means that the dust can get to the deepest parts of the lung. Such fine dust is invisible under normal lighting.
- ✓ Keep inhalation of RCS as low as possible.
- ✓ When all controls are applied properly, less than 0.1 mg/m^3 RCS is usually achievable (based on an 8-hour time-weighted average).

Crystalline silica concentrations in common materials

- ✓ See table in sheet ST0.

Access and premises

- ✓ Only allow access to authorised staff.
- ✓ Floors should slope gently towards gulleys, to help dust removal by wet washing.

Equipment

- ✓ Use water suppression to reduce dust emissions.

Procedures

- ✓ Keep surfaces clean - never let stone slurry dry out.
- ✓ Check that there is adequate water for dust suppression.

Maintenance, examination and testing

- ✓ Minerals and silica-containing dusts are very abrasive. Plan regular maintenance.
- ✓ Follow the instructions in the manual - keep equipment in effective and efficient working order.
- ✓ Clean down the equipment before starting maintenance - use wet or dustless methods.
- ✓ Make sure the water suppression is positioned and used correctly; repair any faulty equipment immediately.
- ✓ Daily, look for signs of damage.
- ✓ At least once a week, check that water suppression works properly.
- ✓ Get a competent ventilation engineer to examine the system thoroughly and test its performance regularly.
- ✓ Keep records of all examinations and tests for at least five years.

- ✓ Review records - failure patterns show where preventive maintenance is needed.
- ✓ Carry out air sampling to check that the controls are working well. See sheet G409.

Personal protective equipment (PPE)

- ✓ Ask your supplier to help you select the right PPE.
- ✓ Provide storage for clean and contaminated PPE.

Respiratory protective equipment (RPE)

- ✓ RPE should not be needed if the controls work properly.
- ✓ RPE is often needed for maintenance and some cleaning jobs.
- ✓ Select RPE that suits the wearer, the job and the work environment. Powered or air-fed RPE is more comfortable to wear.

Other protective equipment

- ✓ Provide clean, dust-resistant (eg paper or nylon) coveralls.
- ✓ Skin creams help in washing contamination from the skin. After-work creams help to replace skin oils.

  Caution: Never allow use of compressed air for removing dust from clothing.

Health surveillance

- ✓ You need health surveillance unless exposure to RCS is well below the limit. See sheet G404.
- ✓ Wet work can lead to dermatitis. Check regularly for skin dryness or soreness.
- ✓ Consult an occupational health professional - see ‘Useful links’.

Cleaning and housekeeping

- ✓ Wash down the workroom at the end of each day’s work and clear up sludge.

  Caution: Don’t use a brush or compressed air.

Training and supervision

- ✓ Tell workers that silica dust can cause serious lung diseases.
- ✓ Working in the right way and using the controls correctly is important for exposure control. Train and supervise workers. See sheet ST0.

Further information

- *Controlling exposure to stonemasonry dust: Guidance for employers* HSG201 HSE Books 2001 ISBN 0 7176 1760 2
- For environmental guidelines see sheet ST0

Useful links

- The Stone Federation may advise on health and safety consultants and training providers. Website: www.stone-federationgb.org.uk.
- For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.
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- Also see www.nhsplus.nhs.uk.

This document is available at: www.hse.gov.uk/pubns/guidance/ and www.hse.gov.uk/coshh/essentials/

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

Employee checklist

☐ **Are you sure how to use all dust controls?**

☐ **Is the water suppression working?**

☐ **Look for signs of leaks, wear and damage every day.**

☐ **If you find any problems, tell your supervisor. Don't just carry on working.**

☐ **Make suggestions to improve the effectiveness of dust control.**

☐ **Co-operate with health surveillance.**

☐ **Use, maintain and store your protective equipment in accordance with instructions.**

☐ **Use skin creams provided as instructed.**

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ST3

Hand-held rotary tools: Cutting and polishing

COSHH essentials for stonemasons: Silica

Control approach R

Respiratory protective equipment (RPE)

This information will help employers (including the self-employed) comply with the Control of Substances Hazardous to Health Regulations 2002 (COSHH), as amended, to control exposure to respirable crystalline silica (RCS) and protect workers' health.

It is also useful for trade union safety representatives.

This sheet describes good practice using respiratory protective equipment (RPE) and local air displacement.

It covers the points you need to follow to reduce exposure to an adequate level.

It is important to follow all the points, or use equally effective measures.

Main points

- **High dust levels result from stone cutting and polishing.**
- **This includes tasks such as in-situ refurbishment, where the advice relates solely to using RPE.**
- **Breathing in dust may cause silicosis.**
- **Keep exposure as low as possible using all the controls in this sheet. Make sure the controls work.**
- **You need air sampling. See sheet G409.**
- **Health surveillance is usually needed. See sheet G404.**

Hazard

- ✓ Stonemasonry can produce airborne respirable crystalline silica (RCS).
- ✓ All RCS is hazardous, causing silicosis. This is a serious lung disease causing permanent disability and early death.
- ✓ Silicosis is made worse by smoking.
- ✓ 'Respirable' means that the dust can get to the deepest parts of the lung. Such fine dust is invisible under normal lighting.
- ✓ Keep inhalation of RCS as low as possible.
- ✓ When all controls are applied properly, less than 0.1 mg/m^3 RCS is usually achievable (based on an 8-hour time-weighted average).

Crystalline silica concentrations in common materials

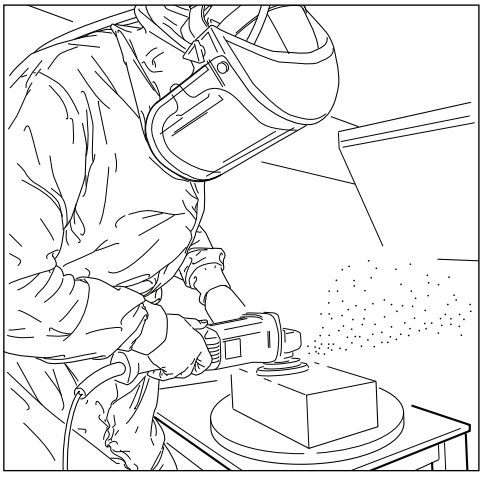
- ✓ See table in sheet ST0.

Access and premises

- ✓ Only allow access to authorised staff.
- ✓ Segregate this task as far as possible to reduce cross-contamination.
- ✓ Floors should slope gently towards gulleys, to help dust removal by wet washing.

Equipment

- ✓ RPE is normally needed to reduce exposures to an acceptable level.
- ✓ Provide extracted booths for all workshop jobs. Can you use water suppression for site jobs?
- ✓ Any captor hood needs to be positioned for optimal dust capture.
- ✓ Use either a down-draught booth or a cross-draught booth fitted with a rotating banker. See illustrations.



- ✓ You need a downward air speed of 0.5 metres per second in a downdraught booth.
- ✓ You need an inward air speed between 1 and 1.5 metres per second at the face of a cross-draught booth.
- ✓ Fit manometers or pressure gauges near the air supply and extraction points, to show that the system is working properly.
- ✓ Mark the acceptable range of readings.

- ✓ Discharge cleaned, extracted air to a safe place outside, away from doors, windows and air inlets.
- ✓ Fit an indicator or alarm to show if filters have blocked or failed.
- ✓ For short refurbishment jobs, can you set up a temporary workshop?
- ✓ Consult experts on new system designs - see 'Useful links'

Procedures

- ✓ Always confirm that the extraction system is turned on and working before starting work.
- ✓ Make sure that workers check that their RPE works properly every time they put it on.
- ✓ Workers should stand to the side of a cross-draught booth, not in the air-flow.
- ✓ Ensure that the dust jet is directed towards the extractor.
- ✓ Clean air pre-filters daily, or follow the manufacturer's advice.
- ✓ Shake down air filters regularly (eg every hour), or use automated reverse-jet cleaning.
- ✓ Make sure you can get spares easily.

Maintenance, examination and testing

- ✓ Minerals and silica-containing dusts are very abrasive. Plan regular maintenance.
- ✓ Follow the instructions in the manual - keep equipment in effective and efficient working order.
- ✓ Clean down the equipment before starting maintenance - use wet or dustless methods.
- ✓ Check that filter seatings are in good condition.
- ✓ If the dust extraction or filtration plant is faulty, stop work until it is repaired.
- ✓ Change inlet air HEPA filters at least once a month or as necessary - seek advice from the unit supplier.
- ✓ Maintain all RPE in effective and efficient working order.
- ✓ Keep airline oil and water traps empty, and filters clean.
- ✓ Daily, look for signs of damage. Noisy or vibrating fans can indicate a problem.
- ✓ At least once a week, check that the dust extraction system and gauges work properly.
- ✓ You need to know the manufacturer's specifications to check the extraction's performance.
- ✓ If this information isn't available, hire a competent ventilation engineer to determine the performance needed for effective control.
- ✓ The engineer's report must show the target extraction rates.
- ✓ Keep this information in your testing log-book.
- ✓ Get a competent ventilation engineer to examine the extraction thoroughly and test its performance at least once every 14 months. See the HSE publication HSG54 - see 'Further information'.
- ✓ Keep records of all examinations and tests for at least five years.
- ✓ Review records - failure patterns show where preventive maintenance is needed.
- ✓ Check the air flow and air quality to air-fed RPE at least once every three months or before use. Ensure that compressors take in only clean air.

- ✓ Make sure that users examine their RPE and test it works properly before each use.
- ✓ Examine and test RPE thoroughly at least once every three months.
- ✓ Keep records of these tests.
- ✓ Carry out air sampling to check that the controls are working well. See sheet G409.

Personal protective equipment (PPE)

- ✓ Ask your safety equipment supplier to help you get the right PPE.
- ✓ Provide storage for clean and contaminated PPE.

Respiratory protective equipment (RPE)

- ✓ RPE is needed and must be compatible with hearing protection.
- ✓ RPE is often needed for maintenance and some cleaning jobs.
- ✓ Select RPE that suits the wearer, the job and the work environment. Powered or air-fed RPE is more comfortable to wear.
- ✓ Decide the level of protection from air sampling data. Otherwise, use RPE with a UK standard assigned protection factor (APF) of at least 40. See sheets R4 and R5.
- ✓ Provide RPE that includes eye and face protection.
- ✓ Make sure all RPE is properly fit-tested - get advice from your supplier.
- ✓ Make sure that workers check their RPE works properly before use.
- ✓ Replace RPE filters as recommended by your supplier.
- ✓ Keep RPE clean and store it away from dust.

Other protective equipment

- ✓ Provide clean, dust-resistant (eg paper or nylon) coveralls.
- ✓ Skin creams help in washing contamination from the skin. After-work creams help to replace skin oils.

  Caution: Never allow use of compressed air for removing dust from clothing.

Health surveillance

- ✓ You need health surveillance unless exposure to RCS is well below the limit. See sheet G404.
- ✓ Consult an occupational health professional - see ‘Useful links’.

Cleaning and housekeeping

- ✓ Clean down the enclosure and equipment as soon as possible after use.
- ✓ Use a Type H vacuum cleaner fitted with a HEPA filter, or wet clean.

  Caution: Don’t clean up with a brush or compressed air.

Training and supervision

- ✓ Tell workers that silica dust can cause serious lung diseases.
- ✓ Working in the right way and using the controls correctly is important for exposure control. Train and supervise workers. See sheet ST0.

Further information

- *Maintenance, examination and testing of local exhaust ventilation* HSG54 (Second edition) HSE Books 1998 ISBN 0 7176 1485 9
- *Respiratory protective equipment at work: A practical guide* HSG53 (Third edition) HSE Books 2005 ISBN 0 7176 2904 X
- *Controlling exposure to stonemasonry dust: Guidance for employers* HSG201 HSE Books 2001 ISBN 0 7176 1760 2
- For environmental guidelines see sheet ST0

Useful links

- The Stone Federation may advise on health and safety consultants and training providers. Website: www.stone-federationgb.org.uk.
- For details of local air displacement controls contact the Health and Safety Laboratory (HSL) e-mail hslinfo@hsl.gov.uk.
- For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.
- Contact the British Occupational Hygiene Society (BOHS) on 01332 298101 or at www.bohs.org for lists of qualified hygienists who can help you.
- Look in the Yellow Pages under 'Health and safety consultants' and 'Health authorities and services' for 'occupational health'.
- Also see www.nhsplus.nhs.uk.

This document is available at: www.hse.gov.uk/pubns/guidance/ and www.hse.gov.uk/coshh/essentials/

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

Employee checklist

- ☐ **Are you sure how to use all dust controls?**
- ☐ **Check your RPE works properly every time you use it.**
- ☐ **Is the air supply and extraction working and in the correct position?**
- ☐ **Look for signs of leaks, wear and damage every day.**
- ☐ **If you find any problems, tell your supervisor. Don't just carry on working.**
- ☐ **Make suggestions to improve the effectiveness of dust control.**
- ☐ **Co-operate with health surveillance.**
- ☐ **Use, maintain and store your protective equipment in accordance with instructions.**
- ☐ **Use skin creams provided as instructed.**

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ST4

COSHH essentials for stonemasons: Silica

Hand and pneumatic chiselling

Control approach R

Respiratory protective equipment (RPE)

This information will help employers (including the self-employed) comply with the Control of Substances Hazardous to Health Regulations 2002 (COSHH), as amended, to control exposure to respirable crystalline silica (RCS) and protect workers' health.

It is also useful for trade union safety representatives.

This sheet describes good practice using respiratory protective equipment (RPE) and dust extraction.

It covers the points you need to follow to reduce exposure to an adequate level.

It is important to follow all the points, or use equally effective measures.

Main points

- **High dust levels result from stone chiselling.**
- **This includes tasks such as in-situ refurbishment, where the advice relates solely to using RPE.**
- **Breathing in dust may cause silicosis.**
- **Keep exposure as low as possible using all the controls in this sheet. Make sure the controls work.**
- **You need air sampling. See sheet G409.**
- **Health surveillance is usually needed. See sheet G404.**

Hazard

- ✓ Stonemasonry can produce airborne respirable crystalline silica (RCS).
- ✓ All RCS is hazardous, causing silicosis. This is a serious lung disease causing permanent disability and early death.
- ✓ Silicosis is made worse by smoking.
- ✓ 'Respirable' means that the dust can get to the deepest parts of the lung. Such fine dust is invisible under normal lighting.
- ✓ Keep inhalation of RCS as low as possible.
- ✓ When all controls are applied properly, less than 0.1 mg/m^3 RCS is usually achievable (based on an 8-hour time-weighted average).

Crystalline silica concentrations in common materials

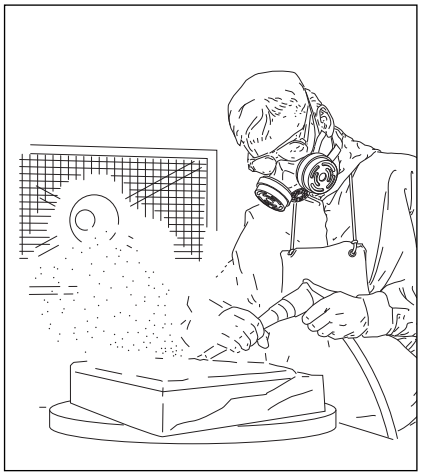
- ✓ See table in sheet ST0.

Access and premises

- ✓ Only allow access to authorised staff.
- ✓ Segregate this task as far as possible to reduce cross-contamination.
- ✓ Floors should slope gently towards gulleys, to help dust removal by wet washing.

Equipment

- ✓ RPE is normally needed to reduce exposures to an acceptable level.
- ✓ Provide extracted booths for all workshop jobs. Can you use water suppression for site jobs?
- ✓ Use a mobile capture hood, or a cross-draught booth fitted with a rotating banker.
- ✓ Arrange the workstation layout so that dust is directed towards the capture hood and the hood is correctly adjusted.
- ✓ You need an air speed between 10 and 20 metres per second into an extracted hood.



- ✓ You need an inward air speed between 1 and 1.5 metres per second at the face of a cross-draught booth.
- ✓ Fit a manometer or pressure gauge near the extraction point, to show that the system is working properly.
- ✓ Mark the acceptable range of readings.

- ✓ Keep extraction ducts short and without bends - avoid long sections of flexible duct.
- ✓ Discharge cleaned, extracted air to a safe place outside, away from doors, windows and air inlets.
- ✓ Replace extracted air - supply clean air into the workroom.
- ✓ Fit an indicator or alarm to show if filters have blocked or failed.
- ✓ For short refurbishment jobs, can you set up a temporary workshop?
- ✓ Consult a qualified ventilation engineer to design new control systems or to update current controls - see sheet G406.

Procedures

- ✓ Always confirm that the extraction system is turned on and working before starting work.
- ✓ Make sure that workers check that their RPE works properly every time they put it on.
- ✓ Workers should stand to the side of a cross-draught booth, not in the air-flow.
- ✓ Adjust a capture hood as close as possible to the cutting point - within one hood diameter.
- ✓ Ensure that the dust jet is directed towards the extractor.
- ✓ Clean air pre-filters daily, or follow the manufacturer's advice.
- ✓ Shake down air filters regularly (eg every hour), or use automated reverse-jet cleaning.
- ✓ Make sure you can get spares easily.

Maintenance, examination and testing

- ✓ Minerals and silica-containing dusts are very abrasive. Plan regular maintenance.
- ✓ Follow the instructions in the manual - keep equipment in effective and efficient working order.
- ✓ Clean down the equipment before starting maintenance - use wet or dustless methods.
- ✓ Check that filter seatings are in good condition.
- ✓ If the dust extraction or filtration plant is faulty, stop work until it is repaired.
- ✓ Maintain all RPE in effective and efficient working order.
- ✓ Keep airline oil and water traps empty, and filters clean.
- ✓ Daily, look for signs of damage. Noisy or vibrating fans can indicate a problem.
- ✓ At least once a week, check that the dust extraction system and gauges work properly.
- ✓ You need to know the manufacturer's specifications to check the extraction's performance.
- ✓ If this information isn't available, hire a competent ventilation engineer to determine the performance needed for effective control.
- ✓ The engineer's report must show the target extraction rates.
- ✓ Keep this information in your testing log-book.
- ✓ Get a competent ventilation engineer to examine the extraction thoroughly and test its performance at least once every 14 months. See the HSE publication HSG54 - see 'Further information'.
- ✓ Keep records of all examinations and tests for at least five years.

- ✓ Review records - failure patterns show where preventive maintenance is needed.
- ✓ Check the air flow and air quality to air-fed RPE at least once every three months or before use. Ensure that compressors take in only clean air.
- ✓ Make sure that users examine their RPE and test it works properly before each use.
- ✓ Examine and test RPE thoroughly at least once every three months.
- ✓ Keep records of these tests.
- ✓ Carry out air sampling to check that the controls are working well. See sheet G409.

Personal protective equipment (PPE)

- ✓ Ask your safety equipment supplier to help you get the right PPE.
- ✓ Provide storage for clean and contaminated PPE.

Respiratory protective equipment (RPE)

- ✓ RPE is needed and must be compatible with hearing protection.
- ✓ RPE is often needed for maintenance and some cleaning jobs.
- ✓ Select RPE that suits the wearer, the job and the work environment. Powered or air-fed RPE is more comfortable to wear.
- ✓ Decide the level of protection from air sampling data. Otherwise, use RPE with a UK standard assigned protection factor (APF) of at least 40. See sheets R4 and R5.
- ✓ If there is a confined space risk, select airline RPE.
- ✓ Provide RPE that includes eye and face protection.
- ✓ Make sure all RPE is properly fit-tested - get advice from your supplier.
- ✓ Make sure that workers check their RPE works properly before use.
- ✓ Replace RPE filters as recommended by your supplier.
- ✓ Keep RPE clean and store it away from dust.

Other protective equipment

- ✓ Provide clean, dust-resistant (eg paper or nylon) coveralls.
- ✓ Skin creams help in washing contamination from the skin. After-work creams help to replace skin oils.

Caution: Never allow use of compressed air for removing dust from clothing.

Health surveillance

- ✓ You need health surveillance unless exposure to RCS is well below the limit. See sheet G404.
- ✓ Consult an occupational health professional - see ‘Useful links’.

Cleaning and housekeeping

- ✓ Clean down the workroom at the end of each day’s work.
- ✓ Use a Type H vacuum cleaner fitted with a HEPA filter to clear up dust (eg on overhead fittings), or wet clean.

Caution: Don’t clean up with a brush or compressed air.

Training and supervision

✓ Tell workers that silica dust can cause serious lung diseases.

✓ Working in the right way and using the controls correctly is important for exposure control. Train and supervise workers. See sheet ST0.

Further information

- *Maintenance, examination and testing of local exhaust ventilation* HSG54 (Second edition) HSE Books 1998 ISBN 0 7176 1485 9
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- For environmental guidelines see sheet ST0

Useful links

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- For details of local air displacement controls contact the Health and Safety Laboratory (HSL) e-mail hslinfo@hsl.gov.uk.
- For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.
- Contact the British Occupational Hygiene Society (BOHS) on 01332 298101 or at www.bohs.org for lists of qualified hygienists who can help you.
- Look in the Yellow Pages under 'Health and safety consultants' and 'Health authorities and services' for 'occupational health'.
- Also see www.nhsplus.nhs.uk.

This document is available at: www.hse.gov.uk/pubns/guidance/ and www.hse.gov.uk/coshh/essentials/

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

Employee checklist

☐ **Are you sure how to use all dust controls?**

☐ **Check your RPE works properly every time you use it.**

☐ **Is the extraction working and in the correct position?**

☐ **Look for signs of leaks, wear and damage every day.**

☐ **If you find any problems, tell your supervisor. Don't just carry on working.**

☐ **Make suggestions to improve the effectiveness of dust control.**

☐ **Co-operate with health surveillance.**

☐ **Use, maintain and store your protective equipment in accordance with instructions.**

☐ **Use skin creams provided as instructed.**

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