

F20 NATURAL STONE WALLING

MORTAR REPAIRS TO STONE WORK

10 REPAIRS TO STONE GATEWAY PIERS, QUOINS and CORNICE

15 All works to be executed in accordance with guidelines set out in English Heritage Technical Handbook: Practical Building Conservation Volume 1, Chapter 4, "Repair with Mortar" (pp34-42). J and N Ashurst, 1988.

20 WORKMANSHIP GENERALLY:

- Cutting, dressing, laying and jointing of stone to be carried out by skilled masons. Provide evidence of previous experience and details of work previously carried out.
- Store stone clear of the ground, protect from inclement weather and keep dry.
- Lay stones on their natural bed on a full even bed of mortar with all joints filled and between 12-18 mm wide. Evenly distribute different shapes, sizes and colours throughout the face of the wall to give a consistent overall appearance and good bond with no long continuous vertical joints.
- Accurately plumb all wall faces, angles and features. Set out carefully to ensure satisfactory junctions and joints with adjoining or built-in elements and components.
- Prevent damage to stonework and keep clean during construction and until Practical Completion. Ensure that no mortar encroaches on face when laying. Turn back scaffolding boards at night and during heavy rain.

40 JOINTING: Finish exposed joints neatly and consistently as the work proceeds. After the initial set has taken place, stipple joints with a stiff brush to remove laitance and give a coarse texture.

45 ADVERSE WEATHER:

- Do not lay stones when air temperature is at or below 3 degC, do not use frozen materials and do not lay on frozen surfaces.
- Adequately protect newly erected walling against rain and snow by covering when precipitation occurs and at the completion of each days work.
- Rake out and replace mortar damaged by frost and where instructed, rebuild damaged work.

MORTAR REPAIRS TO STONE

50 In situ mortar repairs are to be confined to small areas of decayed or damaged stonework where piecing in, or total replacement, is not considered appropriate. The mortar is to contain stone dust to match parent stone colour.

55 Carefully cut back the minimum of decayed/missing stone to a minimum depth of 25ml ensuring that the stone is cut back to the solid base. Tops and sides of cavity are to be undercut to provide a key and avoid feather edging. Where an area is missing it may not be necessary to cut back but only clear off loose fragments to give a solid background.

60 Diamond wheels, hacksaws and points may be used to break out the decayed stonework, but disks must not be used to make perimeter cuts or where there is any risk of over-running.

65 Remove all dust and debris from the cavity ensuring all surfaces are sound.

70 In cavities deeper than 25ml drill and fix non ferrous screws into stonework face to achieve better key for mortar.

75 Where repair is deeper eg. 30-50ml, stainless steel wire is to be fixed around non ferrous screws to form a taught wire armature. Give 20ml minimum cover to all reinforcement.

80 Dampen cavity with water prior to insertion of mortar.

85 Prepare 4 no. samples of mortar to match parent stone and submit to the CA prior to commencement for approval.

- 90 Build up approved mortar in layers of approximately 10ml, compacting at all times. Mortar to be reinforced with goat hair (or similar approved). Score surface in preparation for next layer. Cover and protect to assist initial set. Once set has taken place, apply next layer. Allow final layer to be slightly proud of adjacent stone face and rub back after initial set to align with existing. Protect mortar repair for 3-4 days until set.

STONE INDENT REPAIR

- 100 Indent repairs shall be carried out only where complete removal and replacement of individual stone is inappropriate.
- 110 Carry out survey drawing clearly indicating where indent repairs are to be carried out, and submit to CA for approval.
- 112 Carefully cut out decayed or damaged stone ensuring no damage is caused to adjacent stonework and to stonework arrises. Tool to cut face of the stone to be as smooth as possible in order to accept the new stone.
- If the repair is against a joint, the joint is to be cut out first.
 - The perimeter cuts into the existing stonework are to be straight and even, and to a uniform depth.
 - Thoroughly clean out cut recess and flush out with water as appropriate.
- 115 Stone indents are to match approved sample.
- New stones to be dressed and sized to match existing, allowing for mortar joints, to suit location. Surface treatment of parent stonework is to be replicated on the new stone. Accurate on site measurements are to be taken for each new stone along with full size templates of existing mouldings for inspection by CA prior to cutting/carving.
- 120 The stone mason will be responsible for the accuracy and matching of new stone to existing, including matching of carved, tooled and moulded features.
- 125 Spread a mortar bed to base and/or sides of cavity to a thickness to suit adjacent joints, onto wetted existing stone. Dampen new stone and carefully locate into correct alignment to ensure correct coursing, and that the face is parallel to the existing. The perpend and horizontal joints shall all match the existing joints. Once bedded, the joints shall be pointed up.
- 130 A mortar joint is not to be formed around a repair where it is located within the original stone.
- 135 Dependent upon size and location of indent, new stone to have threaded stainless steel dowels fixed into backing using a thixotropic grout epoxy. Dowel ends to be a minimum of 25mm back from face of stone. Exact number of dowels dependent upon size and location of stone.

RE-FACING OF EXISTING STONework

- 140 **CUTTING BACK OF EXISTING FACE:** Carefully cut back face of decayed or damaged stonework to a minimum depth of 50mm, or further to achieve a sound background, over the entire area of the stone face. Work and tool cut face of the stone to achieve as smooth as possible in order to accept new stone facing.
- 145 **NEW STONE FACE:** Site measurements shall be taken of the stone to be replaced. Full size templates will be required of any mouldings associated with the new stone facing, for architects inspection prior to cutting and or carving.
- 150 **FIXING:** The new stone face is to be doweled to the existing stone using a minimum of three stainless steel dowels with dowel ends minimum 25ml back from face of stonework. Stonemason is to prepare a sketch showing number and location of dowels for CA approval.
The new stone face is to be bonded to the backing 'parent' stone using thixotropic epoxy grout or other approved stone glue.

REPAIRS TO SPLITS, FRACTURES AND DELAMINATION IN STONE

- 160 These repair techniques use combination of epoxy resin and stainless steel pins or rods to consolidate and repair both structural and non structural cracks and lamination in existing stone.
- 165 **STITCHING PINS FOR PINNING REPAIR:** 3mm diameter stainless steel threaded rods supplied by Harris Edgar Ltd or similar approved.
- Locating pins to be high grade stainless steel, 12ml diameter, 100ml long as manufactured by Harris Edgar Ltd or as similar approved.
 - Doweling rods (for repairing fractures and piecing in) to be stainless steel threaded 8 or 10ml diameter to length is required, as manufactured by Harris Edgar Ltd or similar approved.
- 170 **PINNING REPAIR:** Location of holes for stitching pins to be agreed with CA. 15ml diameter stone "plug" to be carefully cut using diamond coring tool and set aside for re-use. 6mm hole drilled for the stainless steel pin, 100ml into receiving stone at approximate angle of 10 deg down from horizontal.
- 175 Clear hole of all mortar and place protective clay plug to keep out dust and debris. After a number of holes have been drilled, remove plugs, fill holes two thirds full with epoxy resin, forming a temporary clay dam to avoid any resin spillage running on to the face of the stone.
- 180 Cut stainless steel pin to the required length and insert. Insert 15ml diameter core-drilled stone plug and point with lime mortar.
- 185 Preparation and application of doweling rods for structural cracks to be carried out as above. Location of rods to be approved by structural engineer.