St James Church, Wick
Repairs to Tower

Specification of the Works

This document includes:

Code	Section	Revision	Date
C41	Repairing / Repointing Masonry		
Z21	Mortars		

North face of tower where a large vertical crack is visible, as well as degrading face stones, and one large quoin stone.

St James Church, Wick has Norman origins. Its west tower dates from the 15th century, but was altered by Pritchard in the 1870's. The church is listed grade II*.

Background

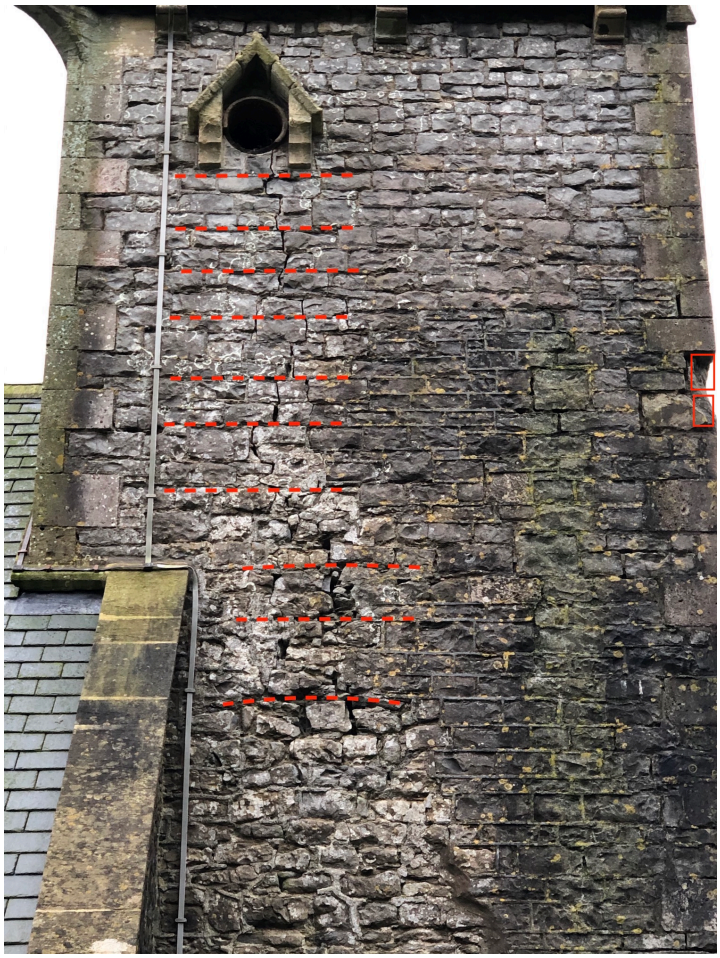
The Tower was inspected by Mann Williams structural engineers in 2006, and again in February 2020. A large vertical crack was evident in both inspections on the north face, and although the defect had not significantly deteriorated during this time, it was nevertheless recommended that a repair should be made. Some of the face masonry has degraded with some loss of small stones leaving voids and further fracturing of some larger facing stones.
The masonry defects were also found to be letting water into the interior of the tower causing rot to the upper timber floor.

Proposal

The tower is to be scaffolded and mortar joints raked out around the affected areas and stainless steel Helibar reinforcement inserted into joints which can then be made good. Cracks will also be made good by filling with mortar and small stones.

Where stones are badly degraded they should be made good by piecing in new stone and/or locally consolidating as required.

Internally, bird nesting material shall be removed to allow further inspection of the tower and, in particular the integrity of the first floor structure, and if necessary take steps to renew decayed elements of timber.



Detail of north face of Tower showing the vertical crack and decaying stonework.

Approx. ten HeliBars inserted across vertical crack (refer to spec.)

Quoin stone repairs using new stone to match existing.

Total area of north face to be repointed.

C41 REPAIRING/ REPOINTING MASONRY

GENERAL/ PREPARATION

110 SCOPE OF WORK
- Repair of stonework, insertion of reinforcing bars, removal of cement pointing and re-pointing of stonework to the external walls of the Tower (north face).

120 SITE INSPECTION
- The contractor is to inspect the walls at tender and as work proceeds and inform the Architect of any unidentified work, including photographs and location for record purposes.

130 REMOVAL OF PLANT GROWTHS FROM MASONRY
- Plants, root systems and associated soil/ debris: where they exist (none visible at present) carefully remove from joints, voids and facework.
- Removal of roots: Where growths exist and cannot be removed completely without disturbing masonry seek instructions.

WORKMANSHIP GENERALLY

150 POWER TOOLS
- Usage for removal of mortar: Not permitted. Only non-powered hand tools are permitted.

155 SCAFFOLDING
- Putlog scaffold not to be used.
- Do not fix scaffold to directly to masonry. Do not drill/anchor into face of stonework.

160 PROTECTION OF MASONRY UNTIS AND MASONRY
- Prevent damage, particularly to arises, projecting features and delicate, friable surfaces. Prevent mortar/grout splashes and other staining and marking on facework. Protect using suitable non-staining slats, tarpaulins etc. Remove protection on completion of work.

165 STRUCTURAL STABILITY
- Maintain stability of masonry. Reports defects including signs of movement that are exposed or become apparent during the removal of mortar or masonry units.

170 DISTURBANCE TO RETAINED MASONRY
- Retained masonry in the vicinity of repair works: Disturb as little as possible.
- Existing retained masonry: Do not cut or adjust to accommodate new units.
- Retained loose masonry units and those vulnerable to movement during repair works: Prop or wedge so as to be firmly and correctly positioned.

180 WORKMANSHIP
- Skill and experience of site operatives: Appropriate for types of work on which they are employed. Documentary evidence may be requested

185 ADVERSE WEATHER
- General: Do not use frozen materials or lay on frozen surfaces.
- Air temperature: Do not lay stones:
- In non-hydraulic lime: sand mortars: At or below 5°C and falling or below 3°C and rising.
- Temperature of walling during curing: Above freezing until mortar hardened.
- Protect at all times from:
- Rain and snow.
- Drying out too rapidly in hot conditions and in drying winds.

- Comply with leaflet attached by Ty Mawr Lime: Application Guide, and the winter weather warning.

190 CONTROL SAMPLES

General: Complete an area of each of the following types of work, and arrange for inspection before proceeding with the remainder:

- Example of mortar pointing and consolidation in stonework

Control samples should be in an inconspicuous location where agreed with the CA

327 LAYING GENERALLY

- Dampen stone in warm/dry weather to reduce suction. Do not soak.
- Laying: Full bed of mortar with all joints and voids filled.
- Appearance: Neat and consistent.
- Orientation for natural bed of stones: Appropriate to properties of stones and positions in walling/ dressings.
- Appearance and bonding: Consistent overall appearance and good bond.
- Random walling:
- Distribute different shapes, sizes and colours evenly throughout the face of the wall. Avoid long continuous vertical joints.
- Cleanliness: Keep facework clean. Rubbing and other abrasive or chemical cleaning methods to remove marks and stains is not permitted.

285 BED JOINT REINFORCEMENT

- Refer to marked up photograph indicating location and number of stainless steel reinforcing bars. These are approximate, and depend upon site conditions and where joints are accessible. Note: bars can be bent to following the line and level of each joint.
- MANUFACTURER: HeliFix, The Mille, 100 Great West Road, Brentford, London TW8 9DW. Website: https://www.helifix.co.uk/products/remedial-products/crack-stitching/
- SIZE: 6mm diameter x 1000mm long, extending 500mm each side of crack.
- MATERIAL: Austenitic stainless steel.
- Joints to be cut into masonry at approximately 400mm centres or where the nearest available horizontal joint is.
- Depth of slot: 50mm
- Rake out slots in mortar joints by hand (no power tools to be used) a minimum 500mm either side of crack to the specified depth.
- Clean out slots and flush with clean water and thoroughly soak the substrate within the slot.
- Using the CS Pointing Gun Kit, inject a continuous bead of HeliBond to the back of the slot.
- Using the HeliBar Insertion Tool, push the Helibar into the grout to obtain good coverage.
- Insert a further continuous bead of HeliBond over the exposed HeliBar, finishing 12mm from the face, and 'iron' firmly into the slot using the HeliBar Inserion Tool.
- Repoint the mortar bed with lime mortar as specified for stonework generally.

TOOLING/ DRESSING STONE IN SITU

458 REDRESSING STONE

- Requirement: Carefully dress back stones to the extent agreed with CA.
- Method: Suitably graded carborundum blocks or tooling as appropriate.

POINTING / REPOINTING

800 EXTENT OF REPOINTING

Random Rubble Stonework where cement pointing has been removed or existing pointing is loose or unacceptable as agreed with the Architect on site.

810 PREPARATION FOR REPOINTING

Rubble and ashlar stonework

- Rake joints out carefully to a depth of twice the width of the joint, but in no case less than 30mm, without damaging the arises of the adjoining masonry.
- Where original mortar is sound and not eroded it should be retained. Do not remove.
- Use suitable jointing, plugging and toothed masonry chisels; hacksaw blades and bent spikes may also be used.
- Hacking hammers, cold chisels and mechanical aids are not to be used.
- Remove dust and any remaining loose debris with a stiff bristle brush and thoroughly flush out with clean water. Avoid unnecessary saturation.
- Dampen down the surface of the joints and adjoining stones to adjust suction immediately before mortar is placed. Avoid unnecessary saturation.

815 RAKED JOINTS: TO BE INSPECTED BY THE CA BEFORE REPOINTING.

820 REPOINTING

Preparation of joints: Dampen joints, as necessary, to control suction.
Mortar: As section Z21.

- Mix: 1:3 dry hot mixed non-hydraulic lime:aggregate.
- Dry hot mixed, aggregate shale Ty Mawr Lime. Quick lime talc & kibble, ratio 5:1 talc and half gaged kibble.

Joints profile/ finish: Recessed back from weathered arris to retain original joint widths.
Brushed finish as clause 860.
Mortar is to be pressed home hard into prepared joint ensuring cavity is completely filled. Do not smear mortar on face of masonry.
In rubble stonework, mortar is to be finished with a flat rough surface flush with the arris of the surrounding stones and then finished to match existing as clause 860. The mortar is to follow the irregularities of the masonry.
Prevent rapid drying out of fresh mortar by covering with sacking or tarpaulins, regularly dampened as required to prevent drying out.
Sample area of one square metre to be prepared for approval of CA.

830 DEEP REPOINTING

Replacement of small loose or defective stones (i.e. less than full course height and less than 100mm long) is deemed to be included in the price for repointing.
Place mortar by filling entirely empty joints in heavily eroded rubble in mortar with additional course stone aggregate and tamp solid in layers of a maximum depth of 40mm.
Finish tamping very tight 25-38mm behind the face to receive pointing as clause 820. Mortar is to be pressed home hard into prepared joint ensuring cavity is completely filled. Do not smear mortar on face of masonry.
Prevent rapid drying out of fresh mortar by covering with sacking or tarpaulins, regularly dampened as required to prevent drying out. Allow 7 days per layer for initial set before commencing the next layer.
If large voids are found behind face stone inform architect, who will consider the need for mortar grouting. Await further instructions.

840 POINTING WITH TOOLS/ IRONS

- General: Press mortar well into joints using pointing tools/ irons that fit into the joints, so that they are fully filled.
- Face of masonry: Keep clear of mortar. Use suitable temporary adhesive tape on each side of joints where necessary. Finish joints neatly.

860 BRUSHED FINISH TO JOINTS

Timing: After initial mortar set has taken place remove laitance and excess fines by brushing, to give a coarse texture. Do not compact mortar.
It is the intention that the brushed mortar should match the existing, allow for thoroughly brushing back the mortar accordingly:
Mortar joints should match the approved Control sample, refer clause 19

Z21 MORTARS

LIME: SAND MORTARS

310 LIME: SAND MORTAR MIXES
- Specification: Historic mortars adjacent to or in the locations in which the new mortar is to be used must be analytically analysed to enable a suitable compatible hot mix mortar to be designed. Proportions and additional requirements for mortar materials are specified elsewhere.

320 SAND FOR LIME: SAND MASONRY MORTARS
- Fine, well graded sand and crushed aggregate or limestone, subject to the detailed mortar analysis.
- Quality, sampling and testing to be regulated by the judgement of contractors, experienced and skilled in the use of lime mortars.
- Grading/ Source: As specified elsewhere in relevant mortar mix items.

340 POZZOLANIC ADDITIVES FOR NONHYDRAULIC LIME:SAND MORTARS
Manufacturer/ Supplier: Dependant on the details of the analysed mortar.
- Product reference: Submit proposal to CA for approval.

Mixing: Mix thoroughly into mortar during knocking up.

360 MAKING LIME: SAND MORTARS GENERALLY
- Batching: Measure materials accurately by volume using clean gauge boxes. Proportions of mixes are for dry sand; allow for bulking if sand is damp.

Mixing: Mix materials thoroughly to uniform consistency, free from lumps. Keep plant and banker boards clean at all times.
Contamination: Prevent intermixing with other materials, including cement.

370 SITE PREPARED NONHYDRAULIC LIME:SAND MORTARS
Mixing: Mix materials thoroughly by compressing, beating and chopping. Do not add water.
- Equipment: Roller pan mixer or submit proposals.

Maturation period before use (maximum): regulated by the judgement of contractors, experienced and skilled in the use of lime mortars.

390 KNOCKING UP NONHYDRAULIC LIME:SAND MORTARS
- Knocking up before and during use: Achieve and maintain a workable consistency by compressing, beating and chopping. Do not add water.
- Equipment: Roller pan mixer or submit proposals.

410 PROTECTING LIME MORTARS
- During and after application, protection should be in place for as long as necessary for the mortar to firstly cure properly, and then dry sufficiently. Do not remove the protection until the moisture content of the mortar is less than 8%.
- Protection is to be provided against rain saturation, strong direct sunlight and/or wind action via small sized mesh debris netting (double if necessary), robust tarpaulins, and/or heavy plastic sheeting. Such protection is to be independently supported on scaffolding to prevent any contact with the mortar, the scaffolding also projecting sufficiently above the works to afford full protection to the wall heads and/or eaves.
- Protection is to be provided against frost or freezing via close covering with Hessian sheets or tarpaulins, with additional heating provided if required. Polythene sheeting should not be used.
- It should be noted that while saturation by rain is to be avoided, light and continuous rain will help to cure the mortar, provided that frost is not forecast, and especially during warm weather.