

Austin-Smith:Lord



The Tower at HMP Manchester

Netting Repair Specification

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1.0 Project Synopsis

Due to the weather damage to brickwork to the Tower at HMP Manchester, a series of conservation repairs are required. While the scope of repairs is being developed, temporary netting is proposed to protect the areas below from falling debris. Due to the height of the Tower, the installation of mast climbers is necessary to provide access for the netting works.

The mast climbers are intended to be in place for the duration of the netting installation works and will be removed at the end of the contract. The netting will be left in-situ pending a capital works project.

As part of the works, brickwork will be cut out labelled and stored to allow the mast climbers to be erected. ON disassembly, the bricks will be reinstated. Fixing holes for the netting will be necessary. When creating fixing holes, drills will be fitted with vacuums to collect the resulting dust and stored for use in repair mortar to be used to repair fixing holes on removal of the netting.

2.0 Scope of Works

Repair works are focussed on works to prevent further water damage, namely:

- Removal of facing bricks locally to facilitate fixing of mast climbers to the inner brickwork;
- Drilling of fixing holes;
- Reinstatement of brick indents on disassembly of the mast climbers (short term works at completion of the contract);
- Filling of fixing holes on removal of the netting (medium term works on commencement of a capital repairs project).

3.0 Repointing Methodology

Careful and sympathetic repointing is of the utmost importance in preserving the colour, texture and general character of old stonework. Strong cement mortars are dark and harsh in colour; also they shrink and pull away the edges of the stones. Flush pointing is unsuited to the irregularly shaped edges and faces of historic stonework and any form of struck pointing gives a hard and mechanical appearance to the wall. The following instructions are to be brought to the notice of every bricklayer and mason employed on the work and are to be carefully and fully carried out.

A full range of samples is to be approved prior to commencement of full scale pointing.

Raking Out:

- Where pointing is sound and has weathered back no more than half the joint width from the face of the stone, it should be left undisturbed;
- Carefully rake out all friable mortar using hand tools only – hacksaw blades or hand chisels (quirks, plugging chisels only) and a 2.5lb lump hammer. Use tools of appropriate width so as not to damage existing arrises and ensure joints are not widened.
- Rake out to a minimum depth of 25mm or twice the joint width, whichever is larger. Remove any dirt and vegetation then clean out the joint with water and a stiff nonferrous brush, leaving a clean and square prepared face of existing sound mortar.
- The use of power tools is not permitted.
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Cutting Out:

- Where cementitious mortar is secure do not try to cut out.
- Carefully cut out any loose cementitious mortar using hand chisels (quirks, plugging chisels only) and a 2½ lb. lump hammer. Use tools of appropriate width so as not to damage existing arrises and ensure joints are not widened, note that the actual joint size is likely to be much finer than any modern re-pointing which may have been applied over the face of the masonry. Ensure that cutting out is always towards a void to prevent wedging and spalling arrises. Where possible remove by band.
- Assess the lime mortar behind and rake out as required as per the methodology above.

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Mortar Mix:

The following mix is subject to mortar analysis.

The brick mortar is typical of Manchester in the 19th century.

The existing mortar bed is dark grey/ black in colour, and a significant reminder of the industrial heritage of Manchester. Dust and ash was an abundant by-product of mining and industry and served as a strong mortar mix when added to lime.

The pointing layer is a fine buff mortar, produced by adding yellow sand and/ or stone dust to lime.

The following mortar mixes is subject to chemical analysis.

Bedding mortar: Submit samples of existing to laboratory for testing. Allow for:

- The mortar for pointing should be 1 part natural hydraulic lime to 3 parts local, clean, well graded sharp sand.; fine coal ash:
- Gauging of sand should be;
 - 1 part pit sand sieved to <2.36mm;
 - ½ part fine sand sieved to <600 microns
 - 1.5 part silica quartz sand sieved to <1000 microns (Coal ash to be substituted up to a maximum of 20% total volume to achieve colour match to existing mortar).
- The sand used should be locally sourced and blended to achieve a good match with the original lime mortar. Samples should be submitted for approval.
- Lime should generally be NHL3.5.
- Mortar shall not be laid when the temperature is 5°C and falling, or when daytime temperatures of less than 5°C can reasonably be expected within 6 weeks of the mortar being placed. Mortar should be stiff but workable and just wet enough to stick to the blade of the pointing key, excessive water content must be avoided.

Fine Pointing Mortar: Submit samples of existing to laboratory for testing. Allow for:

- The mortar for pointing should be 1 part natural hydraulic lime to 3 parts local, clean, well graded sharp sand;
- Gauging of sand should be:
 - Fine sand <600 microns
- The sand used should be locally sourced and blended to achieve a good match with the original lime mortar. Samples should be submitted for approval.
- Lime should generally be NHL3.5 with NHL5 for bedding copings and mortar fillets. Lime is to be supplied by St. Astier or equal approved by the CA.
- Mortar shall not be laid when the temperature is 5°C and falling, or when daytime temperatures of less than 5°C can reasonably be expected within 6 weeks of the mortar being placed. Mortar should be stiff but workable and just wet enough to stick to the blade of the pointing key, excessive water content must be avoided.

Repointing:

- A palette of mortars s to be prepared from the base mixes. Colours can be adjusted as necessary using more or less of the strongly pigmented aggregate.
- A sample panel no greater than one square metre shall be prepared in a discreet location, for approval and to act as a reference panel. Each panel is to be prepared on a selected area of existing masonry previously raked out. A sample of dry mixed sand is also to be provided for sieving to ensure an appropriate range of grains. Sample panels are to test colour and texture; each sample is to be allowed to dry for at least two days before a decision is taken.

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- Ensure the joint and surrounding stone are damp when mortar is placed. Mortar should be firmly pressed and compacted into the joint and ironed in with a pointing iron, keeping the mortar face within the original joint width.
- It is essential that new mortar work is protected from rapid drying effects of wind and sun by means of damp hessian draped over the masonry and rewetted at regular intervals for whatever period is necessary to ensure the proper setting and long term durability of the mortar (minimum five days). A tarpaulin or similar waterproof membrane must be added on top of the hessian as part of the cold weather protection, with other insulating layers included if necessary. This shall be removed on warm, dry days to aid the carbonation process.
- Finish joints ensuring consistency of colour, texture, profile, and overall appearance to match the existing surrounding mortar. Set joint face flush with the face of brickwork unless the joints are very wide or arises are broken. Where masonry arises are eroded, set joint face further back, but avoiding the creation of ledges, which may trap or hold water. Provide a penny finish using a straight edge and rolled old penny.
- Trim off any surplus mortar with a small trowel or pointing key. In order to match the existing texture, undertake bristle brush stippling after the mortar has achieved an appropriate surface set (this may vary according to season from 12 to 30 hours).
- Bristle brush stippling should be carried out by tamping the brush into the mortar to expose the aggregate, never by dragging the brush along the joints.

Site Storage

- Store different sands in different stock piles on hard clean bases which allow free drainage and cover to prevent excessive wetting.
- Store factory produced premixed lime: sand mortars in covered containers to prevent excessive drying out or wetting.
- Store bags of lime in dry conditions, raised off the ground and not touching damp surfaces.
- Avoid contamination and intermixing between stored materials and other building materials, debris or other deleterious matter.

Making Lime: Sand Mortars Generally:

- Batching: by volume. Use clean and accurate gauge boxes or buckets.
- Mixing: Mix materials thoroughly to uniform consistency, free from lumps.
- Contamination: Prevent intermixing with other materials, including cement.
- Use operatives who are skilled and experienced in the making and use of lime: sand mortars. Provide evidence of their experience to the CA on request.
- Keep plant and banker boards clean at all times. Avoid contamination of lime: sand mortar by other materials or by any set material including Portland cement.
- Do not mix lime mortar when the temperature is below 5°C and falling, or below 3°C and rising.
- Thoroughly mix hydraulic lime powder with sand, first in the dry state and then with water. Follow the lime manufacturer's recommendations for each stage of the mix. Add only sufficient water to produce a workable mix.
- Use mortar within time limits recommended by the lime manufacturer. Do not use mortar that has begun to stiffen.

Releasing Brickwork to Erect Mast Climbers

Following recording and agreement of Conservation Architect, bricks to be removed to allow installation of mast climber ties should be carefully cut out using hand tools.

- Prevent damage to bricks being cut out and surrounding work.
- Lay dust by sprinkling with water.
- Bricks are to be cleaned, labelled and stored for reinstatement.
- Releasing brickwork: Provide temporary support as necessary
- Release bricks by cutting out jointing material, easing/levering bricks from their backing.
- Prevent damage to bricks being removed and surrounding work.
- Use manual tools only.
- Lay dust by sprinkling with water.

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- Inspect voids and notify of any signs of structural movement found within walls.

Indenting Brickwork on Removal of Mast Climbers

- Lay dust by sprinkling with water.
- Inspect voids and notify of any signs of structural movement found within walls.
- Preparing beds/ backings: Thoroughly clear out void using hand tools and brushes.
- Treat voids with biocide
- Temporarily support surrounding work.
- Preparing bricks for reuse: Thoroughly clean bricks set aside for re-use to the approval of the CA removing all remaining adhered mortar.
- After agreement with CA dispose of any bricks not to be re-used and supplement with others stored to match or new subject to approval of samples of by the CA and with the agreement of the Conservation Officer.
- Laying/ bonding: In positions as previously occupied as recorded.
- Ensure that bond, joint size and any other special or unusual features are replicated as recorded and to match existing.
- Clean out and flush out or moisten in with clean water, voids to remove dust and reduce suction.
- Dampen bricks and tamp into place on a full and even bed of mortar.
- Pack remaining joints with mortar using a rammer and pointing key.
- Bond type: English bond.
- Joint treatment/ finish: Finish joints ensuring consistency of colour, texture, profile, and overall appearance to match the existing surrounding mortar.
- Set joint face flush with the face of stonework unless:
 - i) this is at difference with the existing surrounding mortar, and/or
 - ii) the joints are very wide or arises are broken; and/or
 - iii) the CA instructs otherwise.
- Where masonry arises are eroded, set joint face further back, but avoiding the creation of ledges, which may trap or hold water
- In order to match the existing texture:
 - a) Carry out such surface treatments as water spraying and bristle brush stippling after the mortar has achieved an appropriate surface set (this may vary according to season from 24 to 30 hours)
 - b) Bristle brush stippling should be carried out by tapping the brush into the mortar.