

Dismantling and Consolidation of
West Gatehouse West Wall

at Monk Bretton Priory, Barnsley

Crooks Architecture

Specifications

Rev A

Materials & Workmanship:

To be read in conjunction with the Schedule of Works and Preliminaries & General Conditions

SCAF Scaffolding:

SCAF.0 Design:

- Submit a fully engineered design (drawings + calculations) by a competent scaffold designer, independently checked to the appropriate category under BS 5975, including the bare-frame and fully-clad load cases.
- Design for wind uplift; demonstrate stability by ballast (kentledge), rakers, or ground anchors in preference to ties into the building.
- Where ties to the structure are unavoidable, design must be agreed in writing with the Conservation Officer / Engineer.

SCAF.1 Fixed Scaffolding:

- Ensure that any standing scaffolding is erected early enough and/or dismantled late enough to suit the programmes of all subcontractors.
- The scaffold is to be erected in accordance with BS 5973 and the Construction (Working Places) Regulations.
- A Certificate of compliance for the erected scaffold is to be provided by the Main Contractor to the Architect. Thereafter, the scaffold is to be inspected at weekly intervals (and after any periods of heavy winds or suspected unauthorised access) by a competent person who is to certify to the Main Contractor that the standing scaffold complied in every respect with the statutory and regulatory requirements. The Contractor is responsible for maintaining a full record of all inspections on site.
- All scaffold is to be free-standing from the building and self-supporting as far as is possible. Where there is a requirement for the scaffold to be tied to the existing building, there will be a presumption that this should be achieved either within stonework bed joints, or alternatively in the centre of individual stones which will then need to be pointed up and made good at the completion of the Works to the Architect's satisfaction. No fixing into the structure will be allowed without the express agreement of the Architect.
- All cross poles are to be capped with plastic end caps to prevent any ferrous staining of existing fabric to be retained. Where adjacent to fragile or important detailing the ends are to be additionally padded with fleece or hessian.
- All scaffolding poles are to be positioned on scaffold end plates so to distribute any downward pressure and all poles below 3m sheathed in yellow scaffold pole padding. Where poles bear onto the existing structure spreader boards of sufficient size shall be fitted.
- The scaffold is to be erected with sufficient lifts and to be altered as necessary to allow the carrying out of the full scope of the repair works specified.
- The Contractor will determine whether or not there is to be an electric or other hoist provided to the scaffold and make all necessary arrangements regarding the safety of any such installation.

SCAF.2 Hoarding:

- Scaffold will need to be protected to prevent unauthorised access to the area of the Works. As a minimum requirement all external scaffold is to be fully enclosed by a hoarding to a height of four metres. The facing must comprise flame retardant plywood sheeting fixed to 75mm x 100mm timbers. The timbers must be either clipped to the scaffolding by appropriate scaffold clips or secured to a substantial stand-alone timber frame complete with adequate internal bracing to prevent collapse if attacked.
- If the scaffolding abuts low-level structures/lifts/features, then the height is to be increased to maintain 4m from the top of said structure.
- All joints of the facing will be tightly butted to prevent tools being used to prise them apart and each joint to overlap a post on the timber frame by 75mm.
- Sheeting will be required to be fixed to the timber frame using 75mm annular ring shank nails at 150mm centres. Tamper proof screws may be used as an alternative.
- The bottom of the hoarding will follow the contour of the ground leaving no gaps between the hoarding and the ground.
- Where the hoarding abuts the masonry walls the facing will be cut to match closely the contours of the building to prevent any gaps being formed.
- **At no point during the scaffolding erection should it be left unprotected without complete, unbroken 4m hoarding. Therefore, at the end of the first day, the hoarding must be fully installed – see SCAF.5**

SCAF.3 Doors & Access:

- There is to be one door only in the hoarding. To be secured via a heavy-duty bolt and sufficient surrounding frame to resist impact. No external handle to be provided only a simple external lock.
- No ladders are to be left accessible from ground, on site at any point while the site is inaccessible (or while there is no presence in the locale of the ladder).

SCAF.5 Protection of Scaffolding During Erection:

- At no point during the erection of the scaffolding should the site be left unattended without the scaffolding being subject to the full protection measures described above. This means that lighting and alarms must be in place on day one and hoarding may need to be temporarily erected around exposed ends of scaffolding at the end of the day, pending continuation of the erection the following day.
- The Contractor will be required to provide photographic evidence of the “as left” scaffolding at the end of each working day, during erection, to seek confirmation of compliance, prior to scaffolders leaving the site.

SCAF.6 Building Off Other Structure:

- Contractor to ascertain that the structural integrity and load-bearing capacity of the surface off which they are erecting the scaffolding is sufficient to take the self-imposed weight and any dead loading of materials, labour, tools, etc.
- Feet are to bear on spreader plates/scaffold boards to prevent damage to roof structures/decks beneath.
- No element of the scaffold can bear onto, or be fixed to, the existing masonry walls.

SCAF.7 Temporary Access:

- Temporary access is defined by any access provisions which will be erected and deconstructed each working day (e.g. ladders/MEWPs/towers).

- Where temporary access is provided this is not to be left unattended at any point and is to be entirely dismantled and stored in a pre-agreed secure location on site (or taken away) overnight.
- All tower scaffolding is to be erected by a person trained in that particular system and have undertaken the "Towers for Users" PASMA training as a minimum.

SCAF.8 Protection of Scaffolding During Erection:

- At no point during the erection of the scaffolding should the site be left unattended without the scaffolding being subject to the full protection measures described above.

SCAF.9 Building Off Other Structure:

- Contractor to ascertain that the structural integrity and load-bearing capacity of the surface off which they are erecting the scaffolding is sufficient to take the self-imposed weight and any dead loading of materials, labour, tools, etc.
- Feet are to bear on spreader plates/scaffold boards to prevent damage to roof structures/decks beneath.

SCAF.12 Protection of Historic Fabric:

- No drilling, cutting, fixing or anchoring into historic masonry, render, joinery or roof fabric without prior written consent from the Architect.
- Standards, ledgers and bracing bearing on the building to use timber soleplates, sole boards and non-marking proprietary pads; protect sills, copings, finials and projecting features with soft padding/boarding.
- Avoid point loads on parapets, gutters and decorative stonework; spread loads onto sound structure only.
- Protect adjacent monuments, headstones, paths and landscaping; agree base-lift positions to avoid buried features.

SCAF.13 Dismantling Scaffolding:

- Dismantle in reverse design sequence; remove all components from site.
- Inspect contact points on completion and make good any incidental damage to the agreement of the Architect.
- The same principles as apply to the hoarding, lighting and alarms during construction, apply during striking.

H&S Health & Safety:

H&S.1 Generally:

- All parties are to employ a collaborative approach to improving health and safety on the project. The Contractor is encouraged to raise concerns regarding safety as soon as possible with the design team and client.
- Parties are encouraged to seek and recommend alternative approaches/methodologies/materials which may reduce risk on the project.

H&S.2 Construction (Design & Management) Regulations 2015:

- The Construction (Design & Management) Regulations 2015 apply to all projects, in some capacity, and all parties must familiarise themselves with their applicable duties and responsibilities under those Regulations.
    - English Heritage is a “Commercial Client” under the Regulations.
    - The appointed Contractor will assume the role of CDM Principal Contractor under the Regulations.
    - Crooks Architecture Ltd. is the CDM Principal Designer.

H&S.3 Contractor’s Responsibilities:

- The Contractor should ensure that the works are planned and executed in full accordance with the Construction (Design & Management) Regulations 2015, under which the Contractor is deemed to be the "CDM Principal Contractor" and therefore must ensure full compliance with all the duties and responsibilities of that role, including, but not limited to:

    - Plan, manage, monitor and coordinate the entire construction phase,
    - Take account of the health and safety risks to everyone affected by the work (including members of the public), in planning and managing the measures needed to control them,
    - Liaise with the client and principal designer for the duration of the project to ensure that all risks are effectively managed,
    - Prepare a written construction phase plan (PDF) before the construction phase begins, implement, and then regularly review and revise it to make sure it remains fit for purpose,
    - Have ongoing arrangements in place for managing health and safety throughout the construction phase,
    - Consult and engage with workers about their health, safety and welfare,
    - Ensure suitable welfare facilities are provided from the start and maintained throughout the construction phase,
    - Check that anyone they appoint has the skills, knowledge, experience and, where relevant, the organisational capability to carry out their work safely and without risk to health,
    - Ensure all workers have site-specific inductions, and any further information and training they need,
    - Take steps to prevent unauthorised access to the site,
    - Liaise with the principal designer to share any information relevant to the planning, management, monitoring and coordination of the pre-construction phase.

H&S.4 Notification:

- The proposed works are not notifiable under the CDM 2015 Regulations.

Common Hazards

H&S.5 Working with Lime:

- Specific precautions for the specific lime product specified is to be found in the Material Safety Data Sheet (MSDS) of the product, available from the manufacturer.

Worker Safety

- Lime, particularly quicklime, is an alkaline material that is reactive in the presence of moisture. All workers handling lime must be trained and wear proper protective equipment.
- *Eye protection:* (chemical goggles, safety glasses and/or face shield) should be worn where there is a risk of lime exposure. Contact lenses should not be worn when working with lime products.
- *Skin Hazards*: Protective gloves and clothing that fully covers arms and legs are recommended. Particular care should be exercised with quicklime because its reaction with moisture generates heat capable of causing thermal burns.
- *Inhalation Hazards*: Lime dust is irritating if inhaled. In most cases, nuisance dusts masks provide adequate protection. In high exposure situations, further respiratory protection may be appropriate, depending on the concentration and length of exposure (consult MSDS for applicable exposure limits).

Product Safety

- Care should be taken to avoid accidental mixing of quicklime and water (in any form, including chemicals containing water of hydration) to avoid creating excessive heat. Heat released by this reaction can ignite combustible materials or cause thermal damage to property or persons.
  Lime dust can be removed from vehicles using rags dampened with dilute vinegar. After applying dilute vinegar, vehicles (especially chrome surfaces) must be washed with water.

First Aid

- The Material Safety Data Sheet (MSDS) for the specific lime product should always be consulted for detailed first aid information. The following guidelines are general in nature.
- If skin contact occurs, brush off dry lime and then wash exposed skin with large amounts of water. If skin burns occur, administer first aid and seek medical attention, if necessary.
- If lime comes in contact with the eyes, they should first be flushed with large amounts of Diphoterine eye wash.
  Seek medical attention immediately after administering first aid.
- For inhalation, remove exposed person to fresh air. Seek medical attention immediately after administering first aid.

H&S.6 Working with Stone (Silica) Dust:

- Before work starts, review ways of stopping or reducing the amount of dust produced when cutting stone. Prevention over management should always be considered preferable. Use different materials, less powerful tools or other work methods. For example you could use:
  - Ensure stone is accurately cut to site prior to delivery to site.
  - Any on site cutting to use low-powered tools.
  - On-tool extraction – removes dust as it is being produced. It is a type of local exhaust ventilation (LEV) system that fits directly onto the tool. This 'system' consists of several individual parts – the tool, capturing hood, extraction unit and tubing. Use an extraction unit to the correct specification (ie H (High) M (Medium) or L (Low) Class filter unit). Don't just use a general commercial vacuum.
- Where water or on-tool extraction is not adequate, provide respiratory protection (RPE).
- Other passive protective measures may include:
  - limiting the number of people near the work;

- rotating those doing the task;
- enclosing the work to stop dust escaping. Use
- sheeting or temporary screens;
- general mechanical ventilation to remove dusty air
- from the work area (eg in enclosed spaces such as
- indoors);
- selecting work clothes that do not keep hold of
- the dust.

- Where Further information on dust and other construction health risks can be found at www.hse.gov.uk/construction/healthrisks/index.htm and HSE Information Sheet "Construction Dust" https://www.hse.gov.uk/pubns/cis36.pdf

H&S.7 Unstable Structures:

- The Contractor is responsible for the protection of the masonry for the duration of the works and must include provision for prevention of collapse within their Construction Phase Plan.
- Before work starts, undertake a review of the existing structure to ascertain any movement since the last inspection. Report any concerns to the Architect and the Structural Engineer and make any adjustments to the site set up which may be necessary to mitigate the risk to structural integrity.
- The Contractor must take all precautions to mitigate the risk of falling debris to site operatives, members of the public and the neighbouring property to the West or the public highway to the East.

H&S.8 Hidden Fabric:

- During the dismantling hidden fabric may become exposed. Any fabric should be reported to the Architect for confirmation on whether evidence of earlier structures is contained within it. The Contractor should undertake a photographic record of any fabric containing evidence of previous construction.
- Toxic materials maybe concealed within the wall. Contractor is to undertake a full assessment prior to commencing the dismantling process to ascertain specific risks. All operatives are to be provided with full PPE to prevent against the risk of concealed items which maybe chemically or physically harmful.
- Concealed structural ties between the West Wall and the North and South Walls may become visible during the dismantling process. In this event the Contractor is to secure the masonry and report to the Structural Engineer to confirm a safe approach to removal.

H&S.9 Adjacent Footpath:

- A public footpath runs at the base of the wall. This will be diverted through the far Eastern archway for the duration of the works. However, the Contractor is responsible for mitigating all risks to the public either through the impact on the surrounding masonry, or through the operation of the site.
- Contractor to liaise with the Client over the footpath closure and to update on any impact of the works on the close
- Anti-social activity is known to occur on the site and so the Contractor must plan to prevent access to site by unauthorised persons and maintain site security in accordance with SCAF.4

H&S.10 Unknown Services:

- The location of the neighbouring properties may mean that services are located beneath the footpath or along the boundary.
- The Contractor must ensure a full survey of all services has been undertaken prior to commencing works including a Ground Penetrating Radar (GPR) scan in accordance with STR.6. The Contractor is to plan the works to mitigate all risks to operatives, the public, the adjacent properties and the wider structure from impact on unknown services.

STR Stripping Out:

STR.1 Generally:

- All works, including stripping out/demolition are to be carried out with the upmost care to avoid any damage to the adjacent structure, fixtures and finishes. The Contractor is deemed to have included for undertaking all works with such care.

STR.2 Extent of Stripping Out:

- Only materials scheduled for removal and for which the requisite statutory consents have been obtained, are to be removed. If there is any question as to the scope of removal, then the Architect must be consulted first.

STR.3 Substrate & Hidden Structure:

- Prior to full stripping out, the Contractor is to ascertain that the structure, substrates and general detailing of the area of the building in question accord with the Architect's drawings. Any discrepancies are to be brought to the Architect's attention and an instruction sought where a variation to the stripping out scope/methodology may be required.
- Upon conclusion of the stripping out provide at least 5 days' notice to the Architect to attend site to inspect hidden and previously unseen structure to ascertain the condition, to confirm the nature and extent of repair/renovation/conservation work shown on drawings and described in survey reports and schedules of work.

STR.4 Structural Support & Temporary Works:

- Do not damage or destabilise the retained structure. Provide all necessary shoring and support to ensure the stability is not compromised. Where stripping out requires removal of structural elements, or excavations, which may destabilise adjacent structure, then the Contractor is to provide an annotated version of the Architect's drawing, illustrating the extent and nature of the shoring up/support structure. Where this will require the involvement of a Structural Engineer to prove supporting structure, the cost of this is to be included in the Contractor's tender.

STR.5 Existing Services:

- Existing, known services (cables/ducts/wires/pipes/etc.), which might affect the works are marked on the Architect's drawings.

STR.6 Unknown Services:

- Undertake a Ground Penetrating Radar (GPR) scan to ascertain any unknown services below ground level.
- Any previously unknown services, exposed during stripping out are to be made known to the Architect.

STR.7 Retention of Materials:

- All materials scheduled for retention, re-use, storage or turning over to the Employer are to be carefully labelled and securely stored in a pre-agreed location.
- Where specified in the Schedule of Works, the Contractor shall include for, and provide evidence upon completion, crediting the Employer with the salvage value of high-value materials (e.g. lead, copper, etc.).

STR.8 Removal of Defective Timber/Stone:

- The Contractor is to refer to the relevant sections of the Specifications for the detailed methodology to employ in the removal of defective timber/stone (or other materials).

STR.9 Recycled Materials:

- The Contractor is expected to use all best endeavours to ensure that all waste materials are recycled appropriately and that the minimum reasonable amount is sent to land-fill. The Contractor may be required to provide a method statement, setting out his approach to reducing waste.

TIM Timberwork/Joinery/Conserving Timber:

TIM.1 Inspection:

- Following stripping out allow for inspection of the structure by the Architect (and if necessary Structural Engineer) to confirm the extent of the timber repairs.
- Allow at least 5 working days' notice of a requirement to attend site.
- Subsequent revisions to specified/scheduled repairs will be given in writing.

TIM.2 Removing Decayed Timber Generally:

- All timber to be carefully removed from the structure.
- The timber has largely decayed but care should be taken to retain any larger sections of the beam. All timber is to be retained by English Heritage and so care must be taken to protect timber during the dismantling process and prepare for transit and storage as necessary.

TIM.3 Recyclable Material:

- Any timber used in propping, supporting or other temporary works should be re-used elsewhere, either on this project or another, and avoid sending it to landfill.
- Avoid contamination of timber (new or old), which might otherwise render it unfit for re-use/recycling.
- If they cannot be re-used, all material is to be retained and delivered to a local recycling project to be turned into furniture or made available to buy in their raw state or taken to a timber recycling company such as *Timberpak Yorkshire, Knowsthorpe Way, Leeds, LS9 0SW*.

MAS Stonework/Masonry Conservation:

MAS.1 Standards:

- Generally comply with the following standards: BS 5642, Parts 1 and 2 specifications for sills and copings; BS 5628, Part 1 structural use of unreinforced masonry; and BS 5390, stone masonry.

Generally & Preparation:

MAS.2 Scope of Works:

- The scope of repairs is as set out on the Architect's drawings and listed in the Schedule of Works.
- Before starting work, use measurements and photographs as appropriate to record bonding patterns, joint widths, profiles, special features, etc.
- Mark clearly, but not indelibly, on face of masonry units or parts of units to be cut out and replaced or reinstated.

MAS.3 Review of Scope:

- A minimum of 7 days prior to commencement of stone conversation works, arrange access and inspection with the Conservation Architect to conform scope. Use this opportunity to highlight any further work evident as being required.
- Before starting work, use measurements and photographs as appropriate to record bonding patterns, joint widths, profiles, special features, etc.
- Any variations to scope to be confirmed in writing by the Contract Administrator/Architect prior to being undertaken.

MAS.4 Removal of Vegetation Within Stonework:

- Vegetation to be cut back from base of wall as early as possible prior to commencement on site and allowed to die back – do not pull green ivy off stonework.
- Remove roots from ground only or from masonry where it is scheduled to be dismantled for repair.
- Where growths cannot be removed completely without disturbing masonry seek instructions from the Architect.
- Where removal of root system is not possible or desirable, cut through stem as close as possible to the ground or cut/drill back a min. 25mm from the face of the masonry to be allow over-pointing. Remove bark from resultant stump and apply herbicide paste. Leave stump to wither.
- Where later decay of stump/roots is likely to cause movement or settlement within the stonework, seek instruction from the Architect.

MAS.5 Removal of Fixtures/Fittings Generally:

- Where fixtures or fittings, including hooks, rails, cramps, etc. are to be removed, attach labels or otherwise mark items using durable, non-permanent means, to identify location and describe refixing instructions, where applicable.
- Securely store on site for reinstallation in location to be agreed with Architect.
- Refit in locations (to be agreed as Schedule of Works/Drawings) using original installation methods.
- Where constructed of ferrous metal, consult with Architect.

MAS.6 Removal/Treatment of Ferrous Metal Fixings:

- Surface fixings are to be drilled out or unscrewed.
- Any lead infill is to be removed with small pieces of wood, using a non-percussive drill on a very low speed (as rapid drilling will melt the lead and clog the drill bit) and the lead cut out in pieces progressively.

- Hidden cramps must be accurately plotted. Treatment/removal methodology to be agree with Architect and may include removal or retention and treatment of corroded surfaces:
    - Removal: Carefully removing the minimum required surrounding stonework, propping that which is to remain in place, to allow for the cramp to be carefully drilled out and (usually) replaced with non-ferrous equivalent, before piecing stones back in.
    - Treatment: May include cathodic protection of retained cramps or exposed surfaces treated with anti-corrosion paint.

Workmanship:

MAS.7 Use of Power Tools:

- The use of mechanical disc-cutters is at the approval of the Conservation Architect only and permitted only to remove stubborn hard mortar bed joints where hand chiselling or other means may damage to the stone, in which case, cutting a relieving joint centrally on the mortar joint before removing the residual mortar by hand. The use on perpend joints is strictly controlled due to the risk of damaging the stones above and below. The arrises of the brick/stonework are to remain undamaged by the raking out. The use of mechanical disc cutters will be subject to a demonstration that the operative is competent and precise enough to undertake the work, avoiding damage to the arrises.

MAS.8 Maintaining Structural Stability:

- Maintain stability of wider masonry. Report to Conservation Architect & Structural Engineer any defects, including signs of movement that are exposed or become apparent during the removal of masonry units.
- Ensure that existing stonework is disturbed as little as possible during the works. Prop or wedge retained loose masonry units and those vulnerable to movement during repair works so as to be firmly and correctly positioned.
- Support structure to be non-ferrous, such as timber. Where scaffolding bars are used, ensure plastic end caps are fitted and a layer of hessian or carpet is placed between poles and stonework to prevent damage.

MAS.9 Protection of Masonry:

- To new or removed masonry units, prevent overstressing during transit, storage, handling and fixing. Store on level bearers clear of the ground, separated with resilient spacers. Protect from adverse weather and keep dry. Prevent soiling, chipping and contamination. Lift units at designed lifting points, where provided.
- To wider masonry, prevent damage, particularly to arrises, projecting features and delicate, friable surfaces. Prevent mortar/ grout splashes and other staining and marking on facework. Protect using suitable nonstaining slats, boards, tarpaulins, etc. Remove protection on completion of the work.
- Do not use frozen materials or lay masonry units on frozen surfaces.
- Do not bed masonry units or repoint in hydraulic lime:sand mortars when ambient air temperature is at or below 5°C and falling or unless it is at least 3°C and rising; and in non-hydraulic lime:sand mortars in cold weather, unless approval is given.
- Maintain masonry above freezing until mortar has fully set.
- Protect masonry from rain, snow or dew by covering during precipitation, and at all times when work is not proceeding.
- Prevent masonry from drying out rapidly in hot conditions or drying winds by appropriate protection.
- Mortar damaged by frost, or accelerated drying out will be required to be raked out and renewed at the Contractor’s expense.

MOR Mortars and Pointing:

Generally:

MOR.1 Standards:

- Generally comply with the following standards: BS5628 Part 3, Code of Practice for use of masonry; BS5390, Stone Masonry, subject to qualifications given below.

MOR.2 Principles:

- Mortar should generally be a little softer and more porous than the surrounding stone itself. It should match the original areas identified by the Architect as closely as possible in colour, texture, performance and strength.
- Unless in circumstances where porosity is not critical (e.g. pointing ridge caps), neat NHL mortar mixes should be avoided due to the limited porosity and availability of free lime within the mix. Preference will always be for a pre-mixed "hot lime" or a mix for which the lime is slaked on site.

Materials:

MOR.3 Sands for Mortars:

- Sands to comply with BS 1200 (superseded but relevant), being sharp, clean and coarse.
- For repair works (including mortar repairs and pointing) sand shall be of the correct colour and texture, such that when dry, it matches the original colour/texture of the original or existing mortar and approved sample. This includes matching aggregate size and grading, unless required to be adjusted to suit particularly weathered or uneven joints.
- Sand to be free from clay, silt, organic matter and excessive fines.
- Blending multiple sands together to achieve required finish/mix/aesthetic may be required.
- All sand and aggregate is to pass a 5mm sieve except where mortar joints are to exceed 15mm width, for which aggregate size should be increased accordingly.
- Sand to be well-graded with a particle size distribution from 2.36mm to 0.150mm (measured using a set of sieves to BS 410:2000), with no one sieve retaining more than 35% of the total mass of the aggregate. No particles able to pass a 0.150mm sieve will be acceptable.
- Where narrower or wider joints occur, the grading will be adjusted to suit, after discussion with the Architect. As a rule, the largest aggregate particle size should be one-third of the mortar joint width.

MOR.4 Limestone Aggregate:

- Where specified, limestone aggregate (crushed or sieved and with small particles size (<0.3mm)) may be used for mortar repairs.
- Where specified, coarser grade limestone aggregate (>0.15mm) may form a proportion of the aggregate content of a building or pointing mortar. Particle size no greater than is permitted for sands.

MOR.5 Water for Mortars:

- Must be clean and fresh and free from organic and harmful matter. Test any water not taken from the mains.

MOR.9 Quicklime:

- High calcium kibbled quicklime for slaking to be either:
  - **Tarmac Kibbled Quick Lime: Calbux 90** from *Womersley's Ltd., Ravensthorpe Indust Est, Low Mill Lane, Ravensthorpe, West Yorkshire, WF13 3LN, Tel:* [redacted] *Email:* [redacted], or

- **Kibbled Quicklime (1-3mm)** from *Eden Hot Lime Mortar, Edenholme, Great Musgrave, Kirkby Stephen, Cumbria, CA17 4DP*.

- Dry slake as clause MOR.23.
- Health & Safety:
  - Calcium oxide is not acutely toxic via the oral, dermal, or inhalation route. The substance is classified as irritating to skin and the respiratory tract and entails a risk of serious damage to the eye.
  - Calcium oxide reacts with water and generates heat. This may cause risk to flammable material.
  - Ensure adequate ventilation. Keep dust levels to a minimum. Keep unprotected persons away. Avoid contact with skin, eyes, and clothing – wear suitable protective equipment. Avoid inhalation of dust – ensure that sufficient ventilation or suitable respiratory protective equipment is used, wear suitable protective equipment. Avoid humidification.
  - Follow Manufacturer's H&S guidance at all times.
  - Use of kibbled lime reduces shrinkage and is safer to use than powdered lime due to the higher reactivity of powdered lime and lack of control over dust in external environments.

MOR.7 Hair

- Animal hair and fibres generally to be used in flaunching, haunching, for backing coats of lime render and lime plaster and generally where significant areas (over 25mm) of mortar are applied without the benefit of masonry units to break them up and contraction and shrinkage cracks are likely, of where additional reinforcement is required.
- Horse hair is to be used in backing coats and but not for finishing coats.
- Goat hair is to be used for "fine-stuff" finishing coats.
- To be obtained from *Womersley's Ltd., Ravensthorpe Indust Est, Low Mill Lane, Ravensthorpe, West Yorkshire, WF13 3LN, Tel:* [redacted], *Email:* [redacted] or equivalent.
- To be stored in clean containers, protected from contamination and kept dry.
- Mixing with mortars at a provisional proportion of 1g of animal hair 1g of mortar. Hair must be carefully "teased" into the mix (layering the plaster and hair then folding it in) to prevent large clumps.
- Substituting with polypropylene fibres is not acceptable.

MOR.8 Natural Cement:

- Product Ref: Vicat Prompt Natural Cement
- Supplier: *Womersley's Ltd., Ravensthorpe Indust Est, Low Mill Lane, Ravensthorpe, West Yorkshire, WF13 3LN, Tel:* [redacted] *Email:* [redacted] or equivalent.
- Add to mortars in proportions as set out at MOR.23 following knocking up of any pre-mixed mortar or after slaking.

MOR.9 Coal Dust:

- Product Ref: Clinker Coal Ash
- Supplier: *Womersley's Ltd., Ravensthorpe Indust Est, Low Mill Lane, Ravensthorpe, West Yorkshire, WF13 3LN, Tel:* [redacted] *Email:* [redacted] or equivalent.
- Add to mortars in proportions as set out at MOR.23 following knocking up of any pre-mixed mortar or after slaking.
- Size: sieved to 1-4mm

Workmanship:

MOR.19 Sampling & Samples:

- Carry out investigations into the presence of existing and/or "original" mortars in the masonry to obtain a sample of existing mortar.
- Where specified in the Schedule of Works that a chemical/compositional match is identified as being a requirement, allow for carrying out a full mortar analysis to identify the binder, aggregate and sand proportions, type and particle sizes/proportions of a minimum of 3 no. existing mortar samples. All endeavours are to be made to match this in any subsequent mortar used. This may be achieved "in house" by the Contractor or by sending a sample to one of the following

  i) Hirst Conservation Ltd., Laughton, Sleaford NG34 0HE.
  ii) Womersley's Ltd., Ravensthorpe Indust Est, Low Mill Lane, Ravensthorpe, WF13 3LN
  iii) or equivalent,

  ...for mortar assessment to identify the composition of the "original" mortar(s).
- Where the Schedule of Works specifies only a visual match, then this may be achieved by creating a sample board and identifying a suitable mix with the Architect.
- Samples to comprise min. 50mm diameter "biscuits", 10-15mm thick, and allowed at least 2 weeks to cure before comparing to existing mortar and seeking approval.
- Following approval of the mortar mix, prepare a $1m^2$ panel of pointing at least 2 weeks prior to commencement on site, in a pre-agreed location, for approval by the Architect, prior to wider-spread use.

MOR.20 Preparation of Site-Mixed Mortars Generally:

- Following approval of sample(s) by the Architect.
- Use clean and accurate gauge boxes or buckets for mixing and batching mortars.
- Mix materials thoroughly to uniform consistency, free from lumps. Mortars containing air entraining admixtures should be mixed mechanically but not overmixed. Maximum working time to be two hours at normal temperature. Prevent intermixing with other materials.
- Measure volumes accurately and using clean gauge boxes. Proportions of mixes are for dry sand, allowing for bulking if sand is damp.
- Keep plant and banker boards clean.
- Sand to be as specified at MOR.3.

MOR.23 Preparation of Dry-slaked "Hot Mix" Mortars (On or Off Site):

- Provisional proportions to be 1 part natural cement (as MOR.8) to 2 parts quicklime (as MOR.9) to 9 parts aggregate (sands/coal dust) (as MOR.3 & MOR.9), such that when the quicklime expands during slaking, the ratio ends up closer to 1:6:9. Aggregate proportion to be 8 parts sand to 1 part coal dust. Sand to be agreed through sampling.
- Calculate volumes of material required to achieve stated proportions by volume.
- Form a slaking "bed" or "box" in which to form the dry-slaked mix using timber scaffolding boards or equivalent over a plastic sheet.
- Lay initial layer of sand/aggregate, followed by a layer of lime and repeat until all material is used up. Aim for a min. 8 layers to retain and build-up heat within the layers. Leave for a min. 24-36 hours to "cook". Avoid rain fall on the sand/lime during slaking.
- Add a small amount of water over the lime as required – to suit weather and wetness of sand - to create heat, but not enough to drown the sand and lime and such that the end mix is dry.
- Ensure sufficient water is used, as quicklime rapidly takes up the water and the mix can overheat. Conversely, avoid excess water as it can reduce the heat of the reaction and lead to the mortar being over-wetted, or 'drowned'. When quicklime has largely slaked but is still warm (or 'hot') and well mixed, sieve or screen to remove any unslaked lumps of lime.

- Transport to site if not produced there and add water (as MOR.5) and knock up into mortar for immediate use.

MOR.24 Preparation of Masonry:

- Existing joints to be raked out to a depth of 40mm or twice the width of the joint, whichever is larger, using hooked tools or small chisels (or hacksaw blades to particularly narrow joints) to remove old cement and lime mortar and creating a square back to the joint.
- The use of mechanical disc-cutters is at the approval of the Architect only and permitted only to remove stubborn hard mortar bed joints where hand chiselling or other means may damage to the stone, in which case, cutting a relieving joint centrally on the mortar joint before removing the residual mortar by hand. The use on perpend joints is strictly controlled due to the risk of damaging the stones above and below. The arrises of the brick/stonework are to remain undamaged by the raking out. The use of mechanical disc cutters will be subject to a demonstration that the operative is competent and precise enough to undertake the work, avoiding damage to the arrises.
- Clean our all joints with a stiff bristled brush and thoroughly flushed out with clean water, avoiding unnecessary saturation. All dust and loose material to be removed, working from the top of the wall down.
- No cleaning agents to be used before or after the repair works.

MOR.25 Application of Mortars:

- Inside surfaces and back of all joints to be consistently maintained damp. If they dry out, re-wet with a hand-held spray, avoiding water left lying in the joint.
- Joints to be thoroughly filled from the back and compacted to prevent voids occurring and to achieve sound adhesion to existing mortar. Particularly narrow joints should have masking tape (or similar) applied to either side of the joint to avoid mortar getting onto the masonry surface. Any smeared mortar on the masonry surface should be sponged off immediately.
- Mortar to be applied with tamping irons to deep joints. Shallower depths of joint may be pointed using traditional pointing irons. Mortar to be applied in maximum 25mm layers, where possible from the top down, to ensure even compaction throughout depth of mortar (not just applied from the outer finish) and to avoid damage to already completed work.
- For deep joints, tamping mortar should be pushed into the joint and dampened stone/slate/brick pushed into achieve an even joint depth that can then be pointed.

MOR.26 Protection and Post Application Care of Traditional Lime Mortars:

- On completion of pointing, allow initial set to take place, then using a churn brush to ensure full compaction and closure of initial shrinkage. Then trim back with hand tools to remove laitance and bring brick/grit aggregate to the fore. Remove excess mortar from stonework.
- Weather protection:
  - Traditional air lime mortars do not require the same protection as hydraulic limes. They do however require the RH to be kept between 40-80% for carbonation to occur. This is done by protecting with regularly dampened blankets or multi-layered dense weave hessian (which can be backed with polythene when especially hot/windy). The covers should be set adjacent to the wall (say 150-200mm/off the first scaffold standard) not directly on it to maintain the RH without keeping the wall wet.
  - Whenever rain is forecast, use polythene sheeting (kept away from the face of the stone to provide ventilation to aid carbonation, but prevent water running down the stone (and mortar) until the mortar has carbonated, so to prevent lime leeching occurring.
  - In strong winds or frost, additional hessian and polythene sheeting may be used.
  - In strong sun or hot weather, damped hessian should be used.

    - Protect the top of all unfinished walling with polythene sheeting, set away from the masonry to enable carbonation to take place.
- Frost protection: Do not lay stonework when air temperature is below 3°C and falling, or when frost is forecast within 24 hours, unless agreed frost protection procedures (heated enclosures, insulated coverings) are in place and approved. Remove any frost-damaged work and repoint or relay as directed by the Architect.
- Staining and contamination: Protect stonework from mortar staining, efflorescence, iron staining and contamination from adjacent trades throughout the works. Use sacrificial cover boards and remove mortar smears promptly with a damp sponge - do not allow to harden on the face. Chemical cleaning to be agreed with Architect before use.
- No works are to be undertaken during frost conditions. Pointing not to be undertaken below 5 degree and falling, to resume only when it is 3 degrees or above and rising. Max/min thermometers to be kept on site at all times and day and night readings recorded for the duration of the contract.
- Any mortar or stains caused by the works on the face of the masonry must be completely removed immediately and before the stains dry or harden.
- Ongoing protection:
    - Produce several mortar pointing samples on site which can be tested after 1, 3 and 6 months to assess the rate of carbonation.
    - For tender purposes, allow for including protection to all mortar for at least 6 months. This may be reduced if the 3-month testing reveals sufficient carbonation and hardening has already taken place.

MOR.30 As Built Information:

- Written records of the mortar mixes used are to be submitted to the Architect and English Heritage upon completion of the project, setting out the materials used, their sources, the proportions and methodology of preparation and application.

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