

Buttress

Manchester City Council

Manchester Art Gallery

MAG-BUT-XX-XX-SP-A-00-0003

Phase 2 Conservation Specification

For Listed Building Consent

P03

13-05-2024

Contents

BUT01 General	1
BUT07 Mortar and pointing.....	9
BUT25 Pointing of ashlar stone	16
C41 Repairing/ renovating/ conserving masonry	18

BUT01 General

Clauses

75 Disclaimer

1. This specification has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of Buttress Architects being obtained.

Buttress Architects accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned.

Any person using or relying on the document for such other purpose agrees and will by such use or reliance be taken to confirm this agreement to indemnify Buttress Architects for all loss or damage resulting, therefore.

Buttress Architects accepts no responsibility or liability for this document to any party other than the person by whom it was commissioned.

100 References and information to be read in conjunction with

1. Please note this specification relates to external works only. For conservation specifications relating to internal Phase 1 works please refer to MAG-BUT-XX-XX-SP-A-00-0001.
2. Please note that this specification is to be read in conjunction with the architectural drawings and preliminaries. Any discrepancies between the documents or omissions from the specification are to be brought to the attention of the Architect at the time of tendering. Note that all specified products are to be installed to the manufacturer's recommendations and by approved installers.
3. The contractor must read in association with all Mechanical, Electrical, Public Health, Structural & Civil Engineers packages.
4. Separate Mechanical, Electrical, Public Health, Structural & Civil Engineering proposals take precedent over indicative architectural information.

105 Definitions and interpretations - General

1. For the purposes of this specification the gallery building with principal facade facing Mosley Street (constructed 1824 - 1835) is referred to as 'City Art Gallery', the gallery building with principal facade facing Princess Street (constructed in 1836 - 1837) is referred to as 'Athenaeum'.
2. Employer's Representative: The person nominated in the Contract as Employer's Representative, Architect, Contract Administrator or Project Manager.
3. Reference specification: Not all clauses in the Reference specification apply to this project. If in doubt about the applicability of a clause, obtain instructions.
4. Communication: When required to communicate – including advise, inform, submit, give notice, instruct, agree, confirm, seek, or obtain information, consent, or instruction, or make arrangements – do so in writing to the Employer's Representative.
5. Responses from the Employer's Representative: Do not proceed until response has been received.
6. Approval: Approval or directions given by the Architect in writing. Unless otherwise specified in the written approval, approval is limited to the visual appearance of the work, materials or components involved and shall not relieve the Contractor from compliance with specification.
7. Conservation Professional: Person registered with conservation accreditation in building conservation from the AABC, RIBA (SCA level) or CIAT-Accredited Conservationist. The Conservation Professional will have specific conservation skills provided by Buttress Architects Ltd.

8. As directed: as defined for 'approval'.
9. As shown on drawings: This is an implied term deemed included within the specification.
10. As Specified: This term means that the work to which it refers is described somewhere in the contract documentation (example, on drawings or in schedules), not necessarily in the specification.
11. BBA: British Board of Agreement.
12. BS: British Standard Specification.
13. CP: British Standard Code of Practice.
14. Fuel: Electricity, gas, oil and any other source of energy.
15. Materials: Materials, components and accessories of every description.
16. Provisional sum: A sum provided for the entire cost of anticipated work that cannot be properly drawn or described.
17. Weather: Specified requirements for weather precautions and protection refer to rain, frost, snow, sleet, gales, excessive sunshine, drying winds, flooding or any other state of the weather which could cause damage or otherwise interfere with the execution of the works.

110 Definitions and interpretations – products and work

1. Remove:
 - a) Disconnect, dismantle as necessary and take out the designated products or work and associated accessories, elements, components, fastenings, supports, linings and bedding materials. Dispose of unwanted materials.
 - b) Excludes taking out and disposing of associated pipework, wiring, ductwork, or other services.
2. Keep for reuse:
 - a) During removal prevent damage to the stated components or materials and clean off bedding and jointing materials.
 - b) Stack neatly, adequately protect and store until required by the Employer or for use in the Works as instructed.
3. Make good:
 - a) Execute local remedial work to components, features and finishes which have been disturbed by other, previous work under this Contract. Make secure, sound, and neat.
 - b) Excludes redecoration and/ or replacement.
4. Repair:
 - a) Execute remedial work to designated components, features and finishes as found in the existing building, resecure or refix as necessary. Make secure, sound, and neat.
 - b) Excludes redecoration and/ or replacement.
5. Refix: Fix removed products.
6. Replace:

Remove the stated existing products, components, features, and finishes. Provide and fit in lieu new components, features or finishes which, unless specified otherwise, must match those which have been removed. Make good as necessary
7. Ease:

Adjust moving parts of designated products or work to achieve free movement and good fit in open and closed positions.
8. Match existing:

Provide products, materials and methods to match closely the appearance and features of the original, excluding ageing and weathering. Make joints between existing and new work as inconspicuous as possible.
9. Match adjacent:

The component is to match existing component in the immediate vicinity, room or area.
10. Appraise:

Means the contractor is to appraise and carry out own independent assessment of the works

detailed here within and update the scope of works as is necessary through consultation with the Architect.

11. Salvaged:
Refers to materials that have been *removed* and *kept for reuse* on this job: no second-hand or reclaimed material are to be used on this project.
12. Consolidation:
Means the contractor is to make something physically stronger and solid. Returning / combing items into a single / coherent whole. Rake out and repoint / build with an NHL mortar. Return to match original profiles. Rebuild in association with structural ties / wall core gravity grouting etc.

115 Documents

1. Currency: References to published documents are to the editions, including amendments, current on the date of the Invitation to tender.
2. Services drawings: Diagrammatic, except to the extent that figured dimensions are given or calculable.
3. Dimensions: Do not rely on scaled dimensions.
4. Ensure that the manufacturers instructions and other information are at the site whilst the related work is being executed. Retain these documents and upon completion of the works, hand them to the Architect in suitable folder(s) together with a contents list.

120 Compliance

1. Submittals, samples, inspections, and tests: Undertake to suit the Works programme. Do not conceal, or proceed with, affected work until compliance with requirements is confirmed.
2. Compliance with proprietary specifications: Retain on site evidence that the proprietary product specified has been supplied.
3. Compliance with performance specifications: Submit evidence of compliance, including test reports indicating properties tested, pass/ fail criteria, test methods and procedures, test results, identity of testing agency, test dates and times, identities of witnesses, and analysis of results.

125 Design and production documentation

1. Design compliance: Submit certification that design complies with documented requirements.
2. Documentation:
 - 2.1. Draft: Submit complete design and production documentation.
 - 2.2. Final: Submit sufficient copies for distribution to affected parties. Keep at least one copy on site.
 - 2.3. Space requirements: Check space requirements of products or work indicated diagrammatically in the contract documents. Submit a report on consequent variations needed to the design.
 - 2.4. Drawings: Include dimensions.

126 Construction problems, issues

1. If any specified materials, components or drawn details appear to be unfit for purpose, or difficult to apply as intended, or if considered to be likely to be detrimental to the works at any time, the contractor is requested to discuss such problems with the Architect as soon as they arise.

130 Authorities and statutory undertakers

1. Approvals: Submit evidence of approvals of relevant authorities and statutory undertakers.

135 Product samples

1. Complying samples: Retain in good, clean condition on site.

140 Products and Execution

1. General quality
 - 1.1. Products generally: New. Proposals for recycled products will be considered.
 - a) Supply of each product: From the same source or manufacturer.
 - b) Whole quantity of each product required to complete the Works: Consistent kind, size, quality, and overall appearance.
 - c) Product tolerances: Where critical, measure a sufficient quantity to determine compliance.
 - 1.2. Execution generally: Fix, apply, install, or lay products securely, accurately, plumb, neatly and in alignment.
 - a) Colour batching: Do not use different colour batches where they can be seen together.
 - b) Dimensions: Check on-site dimensions.
 - c) Finished work: Not defective, e.g. not damaged, disfigured, dirty, faulty, or out of tolerance.

144 Setting out

1. Accurately set out the works in accordance with Section 6 of BS.5606 Code of Practice for accuracy in buildings. Protect any existing bench marks unless otherwise instructed. Ensure that all critical co-ordinate points are marked in a manner that cannot be removed or in a manner that makes any subsequent movement immediately apparent. Check and seek approval for the setting out before commencing work.

145 Sizes

1. General dimensions: Nominal.
2. Cross section dimensions of timber: Finished dimensions.

146 Descriptions

1. Unless otherwise indicated, any description of work to be undertaken shall be deemed to include:
 - 1.1. Material and components as specified and all labour in fitting and fixing in position, including cutting and wastage.
 - 1.2. Use of plant, tools and temporary works of every description.
 - 1.3. All matters of general application as set forth.

147 Acts, regulations etc

1. Compliance, must comply with:
 - 1.1. Any and all regulations made by any authority having jurisdiction over or in connection with the works.
 - 1.2. Code of practice published by BSI and the other major trade organisations.
 - 1.3. British standards referred to in the specification.
 - 1.4. BRE digests and other autoreactive documents prepared by the major government organisations.
 - 1.5. Printed directions issued by the manufacturers of proprietary materials and components used (whether specified or not).

148 Compliance qualification

1. Excluding statutory documents, compliance is subject to this specification which take precedent. Compliance with codes restricted to the recommendations for workmanship unless otherwise stated (if the contractor has design input).

149 Strict accordance

1. All construction must be undertaken and completed in strict accordance with all drawings, specifications, schedules, statutory building and planning regulations, health and safety regulations, all relevant British Standards, codes of practice requirements and manufacturers recommendations, standards and instructions.
2. Any discrepancies and/or anomalies across construction information must be reported immediately to the contract administrator prior to commencement of any works.

150 Substitution

1. Products: If an alternative product to that specified is proposed, obtain approval before ordering the product.
2. Work: If alternative work to that specified is proposed, obtain approval before execution.
3. Reasons: Submit reasons for the proposed substitution.
4. Documentation: Submit relevant information, including:
 - a) manufacturer and product reference;
 - b) cost;
 - c) availability;
 - d) relevant standards;
 - e) performance;
 - f) function;
 - g) compatibility of accessories;
 - h) proposed revisions to drawings and specification;
 - i) compatibility with adjacent work;
 - j) appearance; and
 - k) copy of warranty/ guarantee.
5. Alterations to adjacent work: If needed, advise scope, nature, and cost.
6. Manufacturers' guarantees: If substitution is accepted, submit.

155 Incomplete documentation

1. General: Where and to the extent that products or work are not fully documented, they are to be:
 - a) Of a kind and standard appropriate to the nature and character of that part of the Works where they will be used.
 - b) Suitable for the purposes stated or reasonably to be inferred.

160 Manufacturer's recommendation

1. General: Comply with manufacturer's current printed recommendations and instructions.
2. Changes to recommendations or instructions since close of tender: Submit details.
3. Manufacturers' current recommendations and instructions: Keep copies on site.
4. Ancillary products and accessories: Use those supplied or recommended by main product manufacturer.
5. Agrément certified products: Comply with limitations, recommendations, and requirements of relevant valid certificates
6. Strictly observe all manufacturers written instructions, particularly in respect of handling, storage life and conditions, preparing, fixing and protecting.
7. Should a manufacturers instructions and this specification be at variation, seek instructions from the Architect.

165 Defects in existing work

1. Reporting undocumented defects: When discovered, immediately give notice. Do not proceed with affected related work until response has been received.
2. Documented remedial work: Do not execute work which may:
 - a) hinder access to defective products or work; or
 - b) be rendered abortive by remedial work.

166 Before commencing work

1. Liaise with all parties concerned and arrange liaison between trades. Do not start or continue any part of the work until:
 - 1.1. Environmental conditions are suitable for the type of work involved.
 - 1.2. Supervisors are satisfied that operatives understand what is required.
 - 1.3. Related preceding work is fully completed and if necessary, tested and approved.

170 Accuracy, appearance and fit

1. Tolerances and dimensions: If likely to be critical to execution or difficult to achieve, as early as possible either:
 - a) submit proposals; or
 - b) arrange for inspection of appearance of relevant aspects of partially finished work.
2. General tolerances (maximum): To BS 5606, tables 1 and 2.

175 Service runs

1. General: Provide adequate space and support for services, including unobstructed routes and fixings.
2. Services inaccessible after installation: Submit proposals for future location and identification of runs and fittings.
3. Fixing of services: Submit typical details of locations, types, and methods of fixing of services to fabric.

180 Spares

1. General: Supply designated spares in their original packaging.

195 Other specifications

1. Other Specifications: This specification is not to be read in isolation and is to be read in conjunction with all other specifications and contract documents. This general specification may be supplemented by particular specifications where individual materials and craft skills are appropriate to a particular region or locality.

200 Sub-consultants, specialists

1. General: The specification must be read in association with all available sub consultant / specialists' information, including drawings, schedules, specifications, and reports. Any discrepancies / anomalies identified are to be brought to the attention of the Architect as soon as they become evident.

250 Contractor designed packages

1. Where appropriate, sub-contractor designed packages related to the architectural elements are highlighted upon drawings and within the preliminaries.
2. The contractor will be responsible for developing the design intent drawings / solutions as necessary.

252 Limitations

1. The existing general arrangement base drawings (plans, sections, and elevations) are provided by the Client and are of unknown provenance (unless otherwise stated on the drawings) and in some instances, may not reflect the current arrangement. Dimensions and arrangements must be checked for accuracy onsite by the contractor, prior to any works commencing, ordering or manufacture / fabrication of any elements or components.
2. No concealed and / or hidden spaces have been exposed and / or opened up for inspection, unless specifically highlighted. Therefore, the arrangement and interfacing illustrated across details are purely indicative / approximate only. The accuracy of the survey data graphically presented cannot be confirmed. These drawings are for tender purposes only.
3. No hidden or concealed spaces have been assessed or opened up, unless otherwise noted.

255 Drawings

1. All dimensions are in millimetres unless noted otherwise.
2. Any discrepancies / irregularities must be reported to the Architect immediately. No work shall commence until any such discrepancies have been resolved.
3. In any project involving fabric repairs, the tendered drawings may have been prepared well in advance of the contract period and are reflective of the condition / arrangement at the time of survey.
4. The marked-up drawings are based upon surveys from ground level and other accessible vantage points only.
5. The contractor and/or subcontractor must allow a period of two weeks in their programme, to reappraise the drawings and confirm the scope of works to each identified area, once appropriate and safe access has been provided.
6. All areas for repair are to be marked up from the drawings onsite by the contractor and agreed with the Architect, prior to commencing any works.
7. Quantities / areas identified are for tender purposes only.
8. Specific drawing references are provided against each of the work items throughout this specification, however the contractor must read and appraise all drawings, schedules and specifications provided, against those specifically referenced. If the contractor believes that they are not in possession of the correct and/or relevant information, they must advise and report to the Architect immediately.

260 Familiarisation

1. The contractor shall fully familiarise themselves with the buildings, site and its construction prior to commencement.

280 Onsite recording prior to works

1. Prior to the commencement of any work on site the contractor is to undertake an inspection of the exterior envelope (across the entire site) and thoroughly record to provide a snapshot in time and reference archive material for future usage.
 - 1.1. The contractor is to provide a photographic survey and report of any significant defects (which differ from those illustrated) to the Conservation Professional, this should be provided digitally.
 - 1.2. The contractor shall agree with the Conservation Professional and clearly label onsite items, fabric and contents that are not to be demolished but are to be carefully protected and retained for reuse, conservation and/or restoration works.
 - 1.3. Subject to approval and prior to commencing removal of detritus, the contractor shall ensure that all items to be salvaged are identified, set aside, protected, labelled (catalogued & tagged), safely stored for reuse and/or retention.
 - 1.4. The contractor shall adopt the following strategy for recording onsite items, as follows:

- a) Full photographic survey of external areas prior to any works taking place.
- b) Photograph each specific asset, component and/or element which are to undergo works (removal, repair, restoration etc), including but not limited to:
 - i. Wall fixed items
 - ii. Windows; varying types, surrounds, cills, ironmongery etc.
 - iii. Door set; varying types, door leaf(s), frame, architraves, ironmongery etc.
 - iv. Take mouldings and profiles (cross sections/dimensions) of elements and components to allow for reproductions (like-for-like) to be produced.
 - v. Where elements of the fabric are loose, carefully remove (retain intact as far as is feasible), tag and store a remnant (of the above) of each instance to assist with future matching within a designated area within the building.
 - vi. It will also be possible to record areas of the fabric which were previously unseen: offering a unique opportunity to gather invaluable data, previously unavailable.

290 References

1. Some standards in this specification may have been withdrawn by the British Standards Institution but remain appropriate and applicable for the traditional repair and reinstatement of historic building fabric. Copies of these withdrawn standards may be obtained online.

Ω End of Section

BUT07

Mortar and pointing

Clauses

101 Mortar mix

1. Mortar Mix: Only after a sample has been approved by the Conservation Professional shall the Contractor prepare aggregate blended to the correct grading and/or coarse stuff. The Contractor should therefore be aware of the subsequent preparation and standing times, including initial and final setting times prescribed in this Specification for the various materials.
2. For tendering purposes, assume the following basic mixes: Exact proportions are to be agreed with the Architect on site following the preparation and testing of samples.
 - 2.1. Hydraulic limes, based on St. Astier NHL2:
 - 1 part NHL2; 1 part sieved Baston plastering sand; 1 part Baston sharp sand; 1 part Clipsham stone dust.
 - 1 part NHL2; 2 parts sieved Baston plastering sand; 1 part yellow building sand.
 - 2.2. Putty limes, based on mature Singleton Birch lime putty:
 - 1 part putty; 1.25 parts sieved Baston plastering sand; 0.5 part Baston sharp sand; 0.5 part Clipsham stone dust; 0.25 part buff brick dust
 - 1 part putty; 1.5 parts Clipsham stone dust; 0.75 part yellow building sand; 0.25 part buff brick dust.
 - 2.3. Hot limes, based on Singleton Birch ML90:
 - 1 part quicklime; 2.5 parts sieved Baston plastering sand; 1 part Baston sharp sand; 0.5 part buff brick dust; 1 part Clipsham stone dust.
 - 1 part quicklime; 3 parts Clipsham stone dust; 1.5 part yellow building sand; 0.5 part buff brick dust.
3. Mix materials sufficiently to obtain a uniform colour and consistency and as specified elsewhere.
4. Lime Putty: Lump lime (quick lime) shall be properly slaked in an excess of water and stirred and hoed to ensure coagulation does not occur. All slaking must be carried out under controlled conditions which are to be strictly in accordance with the CDM regulations. The putty shall then be screened through gauze equivalent to a 2.36mm mesh sieve to BS 410:1999 and 2000 and ISO 3310. Non-hydraulic lime shall then be left for at least 48 hours. Prior to batching all excess water shall be siphoned off. It shall then be matured for not less than three months. The putty at time of use to be strictly in accordance with BS 890:1972, BS 6463:1999 and BS EN 459:2010.
5. Dowels Cramps and Joggles: Where it is necessary to secure newly prepared stone or refit existing stone that has become loose with mechanical means, dowels or cramps may be used. Dowels or cramps are to be phosphor bronze or 316 stainless steel grouted in with lime mortar or a lead pour between the stone and the fixing. Dowels shall be threaded or notched to aid purchase on the stone. Where these materials cannot be used a two-part epoxy resin may be used with prior agreement. The position, size and type of cramp or dowel are to be agreed with the architect before preparation is made to receive the fixing.
6. Where appropriate lead joggles may be used to align indented stones.
7. Coarse Stuff; (Non-hydraulic lime): The coarse stuff of one-part air lime putty to three parts sand shall be batched by gauge box. If it is mixed in a mechanical mixer only the minimum amount of water to achieve mixing shall be added.
8. The coarse stuff of air lime and sand shall then be kept covered with damp sacking or polythene sheeting to prevent drying out, and stored for a period of two weeks before use in the main work.
9. Hydraulic Lime:Sand Mixes: Mortar is to be prepared using hydraulic lime and well graded aggregate of the appropriate particle size to suit the joint width.
10. In exposed locations where the stone is hard and durable (e.g. to parapets) a moderately or eminently hydraulic lime may be used.

11. All mixing and handling equipment is to be kept clean. Containers, boards, tools, etc. shall be well cleaned before the next batch of mortar is mixed/used.
12. Measures: Constituents by volume in clean gauge boxes. Cement gauging boxes are to be kept dry at all times. Gauging by the shovel is strictly forbidden.
13. Mixing: Hydraulic lime is to be added to dry aggregate when knocking up the appropriate mortar mix. The addition of water must be kept to the minimum and should not exceed 75% of the lime by volume. Additional workability if necessary may be achieved by increasing the mixing time not by adding water. A mechanical paddle mixer may be used. If a roller pan mixer is used it must be correctly set to avoid crushing of the aggregate. All mortar is to be used within two hours of mixing.

103 Materials: Water

1. Water shall be clean and fresh, free from organic and harmful matter in such quantities as would adversely affect the properties of the mortar. Test in accordance with BS EN 1008:2002 any water not obtained from the mains.

104 Materials: Lime

1. Non-hydraulic Lime: To comply with BS 890: 1972, BS 6463: 1984/1987 and BS EN 459.

N.B. BS 890:1972 is also relevant for traditional feebly hydraulic and grey chalk limes. Although withdrawn by the BSI, BS 890:1972 remains applicable in this specification for the traditional repair and reinstatement of historic building fabric and associated alterations.

2. Lime Putty: Lime Putty: Air/pure lime (i.e. non-hydraulic lime) putty may be obtained from an approved supplier or prepared by the traditional method of slaking lump lime. Lime putty must comply with BS 890:1972 and BS 6463:1987. Hydrated non-hydraulic lime is not to be used unless specified.
3. NHL 2: Hydraulic lime is to comply with European standard BS EN-459-1:2015, 2:2021 and 3:2015. NHL 2 may be obtained from:

Note: Lime suppliers are to submit the whiteness index and compressive strength for their lime mixes at 2 years prior to the sample preparations.

3.1. Womersley's Ltd
Ravensthorpe Indust Est,
Low Mill Lane,
Ravensthorpe,
West Yorkshire.
WF13 3LN.
E: info@womersleys.co.uk
Tel: 01924 400651

3.2. Telling Lime Limited
Booths Hall
Booths Park
Chelford Road
Knutsford
Cheshire
WA16 8GS
E: info@tellinglime.com
Tel : 01565 756110

3.3. Conserv
Lee Road
Bolckow Industrial Estate
Middlesbrough
North Yorkshire
TS6 7AR

E: support@conserv.co.uk
T: 01642 430 099

- 3.4. Burning of the stone to produce NHL 2 has to be by special arrangement. This is to be used for all fine ashlar joints and gauged brickwork with mortar joints of 2mm or less. An alternative method of obtaining a similar lime is to blend a freshly slaked non-hydraulic putty lime with a NHL 2. These vary from one manufacturer to another and therefore mix proportions must be tested before use in the main work.
4. Dry Hydrate Fineness: The Contractor is to retain a 0.2mm mesh (200 micron) sieve on site at all times to enable fineness of the dry hydrate to be checked by sampling before use.
5. Lime putty is to be stored in clean containers, protected from contamination and kept in an excess of water to prevent carbonation.
6. Hydraulic lime is to be supplied in bags which must be date stamped with the day of manufacture. Hydraulic lime over 3 months old must not be used. All bags must be delivered to site undamaged and dry without moisture penetration of the covering. Dry hydrate that has been exposed to the air or moisture in transit and in damaged bags is to be rejected.
7. Hydraulic lime must be stored in a dry weatherproof building with a raised floor. Record the date of delivery. No materials may be stored on the ground. Do not store bagged lime on site for more than ten weeks.

105 Materials: Fine aggregates

1. Aggregate: The word “aggregate” in this context includes one or more of the following:- sand, broken or crushed stone and crushed brick. It also includes other crushed inert materials. If sand particles are not of the correct colour or size, or the aggregate in the existing mortar to be matched is composed of crushed or broken stone or other material, this is to be matched with a similar material.
2. The existing ashlar stonework to the City Art Gallery and Athenaeum has very fine joints, in some cases <5mm. This will require the application of fine aggregates as a larger sand grain size is likely to impede filling the joints. In these instances, fine stone dust or buff brick dust should replace the sand as the fine aggregate.
3. All sand shall be to BS 1199 & 1200:1976 and BS EN 13139:2013, being well-graded, non-staining, clean, sharp, coarse sand, uncontaminated by clay/silt. Sand shall be selected so that when the mortar has dried out the colour will match the colour and texture of the original mortar, unless instructed otherwise in writing by the Conservation Professional. The aggregate size is to be well graded to match as closely as possible the existing approved mortar sample and to be appropriate to the width of the joint.

N.B. BS 1199 & 1200:1976 remains applicable in this specification for the traditional repair and reinstatement of historic building fabric and associated alterations.

4. Sands and pozzolans are obtainable from:

[Particle size of brick dust and colour appropriate to specific site conditions to be given following preparation, curing and laboratory testing of samples by the Contractor.]

- 4.1. Womersley's Ltd
Ravensthorpe Indust Est,
Low Mill Lane,
Ravensthorpe,
West Yorkshire.
WF13 3LN.
E: info@womersleys.co.uk
Tel: 01924 400651
- 4.2. Rose of Jericho,
Horchester Farm,
Holywell,
Dorchester.
DT2 0LL.

Tel: 01935 83676
E: info@roseofjericho.co.uk

4.3. Ty Mawr
Llangasty
Brecon
Powys
LD3 7PJ.
E: tymawr@lime.org.uk
T: 01874 611350

5. For NHL 2 and lime putty mixes: The sand shall be free of clay, silt, organic matter and excessive fines. At least half its content shall be a quartz sand, blending from different sources may be necessary.
6. The maximum particle size and grading will be related to the joint width. All sand and aggregate must be evenly graded with no more than 35% and not less than 10% of any one grading retained on each consecutive sieve size. Sieve sizes that apply depending on mortar joints are 5.0, 2.36, 1.80, 0.6, 0.3, 0.15 and 0.075 mm.
7. Where narrower or wider joints occur the grading will be adjusted to suit after discussion with the Conservation Professional. Generally the maximum particle size should be no less than one third of the joint width.
8. Suppliers of lime to be consulted on suitability of aggregates proposed. Ideally aggregates to be obtained from the supplier of the lime.
9. Transport, Storage and Handling of Materials: Approved sands shall be stored in clearly marked bags or bunkers and protected from inclement weather, site debris, leaves and the like. Quantities shall be based on the use of dry sand and accurate allowances made for bulking.

110 Pre-works

1. Before any re-pointing work is undertaken, a survey of the building / asset / structure, shall be carried out by the supervising officer and the contractor to determine the precise areas to be re-pointed. Often much of the old lime mortar raked out is sound and could, with advantage (appropriate access), have been left in place. It is essential that all pointing is carried out to match previously approved samples.

115 Preparation

1. In preparation for repointing works, using hand tools only, rake out all loose jointing material (see clause 125 below). All raking/cutting shall leave a clean, square face at the back of the joint, so as to provide optimum contact with the new mortar.

Under no circumstances should an angle grinder or similar tool be used.

There are power tools that use oscillating blades (Fein saw type) to rake out fine joints; care must be taken with these, especially if the masonry is softer than the mortar, as the blade can slide off the mortar and cut into the masonry.

2. The prepared face and joint should be carefully cleaned out with a natural bristle brush or low pressure compressed air and thoroughly flushed out with clean water, avoiding unnecessary saturation. All dust and loose material must be removed, working from top to bottom of the wall.
3. All raking out and cleaning works should be available for inspection prior to commencement of the repointing.
4. No cleaning agents or fungicides are to be used either before or after repair works, except on the express authority of the Conservation Professional or in connection with treating root pockets.
5. Any sound pointing should be left undisturbed, even if it has weathered back behind the general wall face to as much as half the joint width. Generally, only rake out where the existing mortar is capable of being removed by raking out by hand with a blunt instrument, leaving the arrises of the brickwork or stone unharmed. A hammer and chisel should not be used unless permitted by the Conservation Professional.

The definition of failed means that the pointing has cracked, been partially lost or created a water trap.

6. Any metalwork such as iron wedges found in the mortar joints will be recorded and then removed where possible.
7. Where it is desirable to remove damaging and unsightly cementitious pointing, experiments should be carried out to the approval of the Conservation Professional to ascertain the most appropriate method of removal and to limit damage caused to existing work.
8. Removal of vegetation growth: Refer to BUT10.

120 Application

1. Mortar should be plastic and workable but as stiff as possible. It should be pushed into the back of the joints in layers, avoiding large volumes of deep filling at all times.
2. A “well filled” joint is close to flush with the surrounding masonry / rubblework.

125 Pointing Methodology

1. For pointing brickwork, refer to BUT09. For pointing ashlar stone, refer to BUT25.
2. It is essential that the masonry is thoroughly dampened when pointing is commenced. If the joints have dried out before cleaning, they must be re-wetted with a hand-held spray prior to placing of any new mortar. No water should be left lying within the prepared joint.
3. Repointing work should begin at the uppermost section of the wall and proceed downwards, ensuring that all the mortar is pressed well into the joints to achieve good compaction. Fill all the joints solidly with the approved mortar mix finishing very slightly back from the masonry and in accordance with the approved sample. The mortar is not to be spread or buttered onto the face of the masonry unless specified.
4. When re-pointing, joints should be raked back to approximately 25mm (or to a depth of not less than twice the joint width, whichever is greater) thoroughly cleaned, including the top and bottom faces of the beds, ready for the new mortar. Pinning stones should not be removed, but if they are loose, they should be removed and put back during the re-pointing. Where a wall has previously been re-pointed and the pinning stones have been lost, suitable replacements should be used. The walls should be well washed to remove any dust and loose friable material making sure that the entire elevation is cleaned down to prevent staining on the walls. Impervious masonry should be dry when the work commences, however the original backing mortar should be kept damp.
5. The mortar must be of minimum water content and should be pushed into the joint to its full depth and firmly ironed in with the maximum possible pressure and minimum of over-working. Pointing irons should be used, not pointing trowels. The pointing irons may be cranked, bronze or steel flat of a width which will fit into the joint and ensure compaction over the full width. Compaction is therefore achieved throughout the depth of the joint each time mortar is placed rather than from the surface alone. The Contractor should be aware that it may be necessary for them to fabricate pointing irons to undertake the works.
6. Pointing deep joints should be done in layers of 20 - 25mm at a time, allowing the preceding layer to take up before applying the next.
7. If the joint is to be filled in one operation, the mortar must be almost crumbly and be ironed in very firmly.
8. Where joints widen out due to erosion of the existing stone the pointing is to be kept back to ensure that a consistent visual joint is achieved. Care is to be taken to ensure that a free draining surface is always maintained or created.
9. To ensure good compaction and adhesion within the joint, the mortar can be tamped firmly back with a stiff bristle brush as it starts to firm up. The timing of this is critical. If it is carried out too soon after placing, fines in the mix will be drawn to the surface and will form a dense skin, inhibiting the proper curing of the mortar. Once the surface of the mortar is firm (usually the next day) it is to be stippled with a stiff bristled non-ferrous brush to give a texture to the pointing and

to remove the smoothness of the pointing bar – giving a 'weathered' appearance. The bristles should not be dragged across the face but tapped hard against it.

10. When placing the mortar ensure that it is placed in the joint and does not spread over the adjacent stone/ brick and cause any lime staining. Likewise, when finishing off ensure no lime is brushed or sponged over the face of the adjacent stones causing lime staining. Such lime staining will not be considered acceptable as a finished result. Surplus lime on the face and arrises of masonry should be cleaned off immediately and all faces kept clean at all times to avoid staining. Clean off any surplus or spread of mortar with a clean pointing trowel as work proceeds.
11. Any slight fractures due to shrinkage must be cut out and remade prior to practical completion of the contract and for final completion at the end of the defect's liability period.
12. It is essential that perpends are allowed to run into horizontal bed joints without any clear definition or "lining" occurring such that the mortar should visually transfer from perpend to bed joint in a smooth manner.
13. Filling in pointing is to be carried out in small areas such that all operations can be completed within the working day with due notice being paid to any potential adverse weather conditions.
14. The work is to be kept clean from mortar spillage at all times. Completed areas are to be protected until cured.

140 Protection and cleaning

1. For all mortar work, best practice requires proper curing and aftercare against the effects of drying winds, strong sunlight, rain, and frost. Lime mortar may require slightly longer curing times. Where scaffolding is in place, fine mesh debris netting securely fixed to the outside of the scaffold gives basic protection to the working area, slowing down strong wind whilst allowing good natural light for the works. Securely fixed hessian sheets or polythene placed over plywood sheeting on to the top of the scaffold from the wall heads or just below the gutters will ensure that rain does not wash down the face of the walls.
2. Scaffolding should always be erected in such a manner as to allow the highest point of the building to be protected. With regard to external protection, the work should be covered with hessian sheets, polythene, or both. Polythene should never come in contact with the work. Accurate records of the minimum and maximum temperatures below the covers should be taken daily, with provision to record these over weekends and holiday breaks.
3. The work shall be protected from direct sun and rain for a minimum of two weeks (after application). The joint surface finish should be applied and tended at an average minimum temperature of 10°C until the face has dried and hardened. The period of protection must be increased relative to the slower carbonation rate that occurs at lower temperatures.
4. Protect all new work against frost, any joints damaged due to frost action is to be cut out, re-made in frost free conditions, and protected as above.
5. During dry weather, all new pointing shall be kept continuously moist (but not wet) for a minimum of 10 days to ensure that the set takes place slowly. Damping down is to be done with a fine mist spray of clean potable water – not a jet of water – in several applications. Water must not be made to flow down the face of the work when damping down. Allow for tending and spraying down for a minimum of three times a day during this period.
6. Turn back scaffold boards adjacent to brick faces at night and during heavy rain to avoid the disfiguration of finished work by abrasion and splashing.
7. Any mortar or stains caused by the works on the face of the masonry must be completely removed before the mortar hardens.
8. Pointing on horizontal surfaces – copings, paving and the like – is to be protected to prevent undue saturation in wet weather.
9. Frost: Work must not be carried out during frost conditions. Frost must not be allowed to affect completed work before it has fully cured. Manufacturers of hydraulic limes are to guarantee the curing periods for the class of lime supplied.
10. Generally pointing and bedding mortar is not to be laid when the temperature is 5°C or below and falling. Work may re-commence when the temperature is 4°C or above and rising. The Contractor

is to keep maximum and minimum thermometers on site for the duration of the contract to record night and day time temperatures as directed.

11. Winter working and working when ambient temperatures are below 3°C may only proceed where the Contractor has provided sufficient protection and working conditions to ensure average 24-hour day temperatures for all application, preparation and aftercare of the mortar remain no lower than 8°C at all times.

160 Workmanship

1. The mortar shall be a little softer and more porous than the stones/bricks themselves and shall comply with BS 4551:2005 parts 1 and 2 for mortars, screeds and plasters and BS 4550:1978 part 3 sections 3.6 for methods of testing.
2. Sample areas: to be provided as BUT09 / 105 (brickwork) and BUT25 / 105 (ashlar stonework). Test panels must have had time to set.
3. The Contractor is to allow for blending and sieving sands from different sources, as necessary, to achieve appropriate grading, colour and texture.
4. If the Conservation Professional does not consider the sample mixes to be satisfactory in respect of the requirements of this specification, then further samples are to be provided by the Contractor as necessary.
5. Where applicable and sound existing pointing survives in good condition, the Conservation Professional will mark a section which is to be matched in respect of colour, texture and strength.
6. A trial area of pointing is to be executed on specially prepared sample panels (NOT THE EXISTING HISTORIC FABRIC) for approval by the Architect using mortar as specified and approved.
7. Where directed, the Contractor shall prepare a sample panel of masonry, executed in mortar mixes and pointing techniques as specified by the Architect, or to match existing work.

170 Completion

1. The Conservation Professional is to be advised at least two weeks in advance of when pointing will be complete in order that an inspection can be made prior to the removal of any scaffold.
2. Remove all tools, plant and equipment and used materials and debris.
3. On completion leave all clean neat and tidy to the satisfaction of the Architect.

300 References

1. Some standards in this specification may have been withdrawn by the British Standards Institution but remain appropriate and applicable for the traditional repair and reinstatement of historic building fabric. Copies of these withdrawn standards may be obtained online.

Ω End of Section

BUT25

Pointing of ashlar stone

Clauses

100 General

1. The Contractor's attention is drawn to the fact that the joints between stones to both the City Art Gallery and Athenaeum are extremely fine, <5mm, and will demand a great deal of care and attention on site to the preparation, filling and pointing.

105 Sample panels

1. The tenderer is to allow for carrying out six test panels each approximately 1 metre square under the direction of the Architect, using the methods described below. Work to the rest of the stonework should not commence until the test panel has been approved by the Architect. The location of the test panels is to be agreed with the Architect prior to commencement.

Tenderer is to allow for several sample mixes using different coloured fine aggregate to obtain a satisfactory colour for the pointing.

110 Preparation

1. All joints are to be raked out to a depth of 25mm using a fine toothed saw blade or hooked knife. Extreme care is to be taken to avoid damage to the arris or cause dislocation of the stone.
2. Under no circumstances shall chisel and bolsters be used.
3. Under no circumstances will the use of mechanical tools be permitted (disc cutters etc.)

There are power tools that use oscillating blades (Fein saw type) to rake out fine joints; care must be taken with these, especially if the masonry is softer than the mortar, as the blade can slide off the mortar and cut into the masonry.

4. There are power tools that use oscillating blades to clean out joints; care must be taken with these, especially if the stone is softer than the mortar, as the blade can slide off the mortar and cut into the stone.
5. Joints are to be flushed out using a large (30cc) hypodermic syringe and clean water until the water runs clear.
6. Allowance is to be made for the insertion of a backing 'rod'. This item is to be confirmed during the preparation of the sample area.
7. The backing rod is to be fine waxed string or string coated with petroleum jelly, stretched and twisted several times prior to inserting to the back of the prepared joint with a knife blade.

115 Filling and pointing

1. Mortar is to be as section BUT07
2. Filling is to be by the taping and pointing method.
3. The prepared joints are to be covered with 50mm heavy duty carpet tape applied to the stone. The tape is to be slit along the joint line with a sharp knife. It should be noted that the stone will need to be dry for the tape to adhere.
4. The mortar is to be introduced into damp joints and compressed with a purpose made pointing iron/key. Mortar is to be thoroughly compacted into the joints.
5. The mortar is to be pointed firmly into the joints and finished with a very slight recess (not more than 1mm deep).
6. Adhesive tape is to be carefully removed ensuring that no residue of adhesive is left on the stone.
7. Clean off any surplus or spread of mortar with a clean pointing trowel.

120 Progress

1. The works are to be co-ordinated such that preparation is carried out to agreed areas and made available for inspection by the Conservation Professional.. The Contractor is to give at least 48 hours' notice for inspection.
2. No taping or filling of joints is to proceed until preparation has been inspected and approved by the Conservation Professional.
3. Taping, filling and pointing is to be carried out in small areas such that all operations in one area can be completed within the working day with due notice being paid to any potential adverse weather conditions.
4. The work is to be kept clean from mortar spillage at all times.
5. When pointing commences only area which can be successfully completed during the normal working day are to be attempted giving due regard to the weather conditions/forecast.
6. Completed areas are to be protected until cured.

Ω End of Section

C41

Repairing/ renovating/ conserving masonry

Generally/ preparation

100 Inspection and drawings

1. Access:
 - 1.1. Please note the tender drawings have been prepared from visual inspection only, without the benefit of access scaffold. **The Contractor is to allow in their programme a period of 2 weeks for confirmation and re-appraisal of the scope of the works to each area.**
 - 1.2. The Contractor is encouraged to be represented during the inspection in order that he may contribute in any discussion regarding alternative methods of repair.
2. Notice:
 - 2.1. The Contractor is to give a minimum of 48 hours' notice to the Architect of the completion of the access scaffold to each area.
3. Confirmation:
 - 3.1. Confirmation of the scope of the work will be the issue of revised drawings and associated instruction following completion of the inspection from the access scaffold.
4. Scaffold:
 - 4.1. The Contractor shall ensure that all access scaffold alterations are complete and in accordance with the specification and that handover certificates have been issued before inviting inspection. Inspection will not be carried out if the scaffold is not in accordance with the specification.
5. Drawings:
 - 5.1. Tender drawings are to be provided by the Architect. Where fabrication drawings are required to be prepared by the Contractor for specialist areas the Contractor shall submit duplicate copies of the drawings at least two weeks before confirmation of the order for the stonework is required. No cutting of the stonework shall commence until the drawings have been approved.
6. Programme:
 - 6.1. The Contractor is to indicate separately the erection/alteration(s) sequence for access scaffold inspection period, order period and works on site for reach area of work within the programme.

105 Protection, storage, transport and cleaning

1. Protection of work area:
 - 1.1. Where large areas of masonry repairs are to be undertaken the scaffold is to be fully protected using a translucent non-combustible sheet such as Monaflex fixed to the outside of the scaffold.
2. Protection of the fabric:
 - 2.1. Any existing windows are to be protected with ply or particle board in the areas adjacent to any area of work. Other features identified on the drawings are to be protected from damage.
 - 2.2. Where scaffold is erected internally or where scaffolding penetrates through into the building internal fittings shall be adequately protected to protect the historic fabric from damage.
 - 2.3. The Contractor is to cover arrises, mouldings, carvings and other finished work with adequate protection, securely fixed without damaging new or existing fabric, to ensure it is not damaged. Any damaged fabric is to be replaced at the Contractor's own cost. Piecing in or mortar repair will not be considered as acceptable remedial action. Total replacement will be necessary. The Architect is to be advised prior to undertaking such remedial action.

- 2.4. All work should be adequately protected from frost damage. Any frost damaged work is to be cut out and replaced at the Contractor's own expense.
- 2.5. The work is to be protected from direct sun and rain and against rapid or excessive drying until the mortar has properly cured and strictly in accordance with the mortar and pointing specifications. Any work damaged as a result of inadequate protection is to be cut out and replaced at the Contractor's own expense.
- 2.6. Turn back scaffold boards adjacent to finished faces to prevent splashing during heavy rain.
3. Storage:
 - 3.1. Stone should be stored in stacks on battens protected from moisture and freezing. Adequate care is to be taken to ensure that no damage occurs to the stone during storage or handling.
4. Lifting:
 - 4.1. The Contractor shall provide adequate lifting gear to unload and handle stones into position.
5. Storage on scaffolding:
 - 5.1. Only stone for immediate use shall be stored on the scaffold.
6. Protection of finished work:
 - 6.1. Cover arrises, moulds, carving and other finished work to protect from accidental damage. Protection is to be maintained until completion of all work in that vicinity.
7. Cleaning of work:
 - 7.1. Keep facework clean and free from staining at all times.
 - 7.2. Clean off and rub down all stonework to the satisfaction of the Architect as the scaffolding is taken down.
 - 7.3. Any mortar or stains caused by the works on the face of the masonry must be completely removed before the mortar hardens.
8. Transport:
 - 8.1. Transport stone with minimum handling. Stack carefully in vehicle with non-staining packing material to prevent damage.
 - 8.2. Provide adequate lifting plant to unload and handle stones into position.
 - 8.3. Handle stones with tackle, crane or other mechanical aids as necessary.

110 Scope of work

1. **Drawings:** Refer to work package 14 and 15 drawings MAG-BUT-14-XX-DR-A-00-0001-0011 and MAG-BUT-15-XX-DR-A-00-0001-0003
2. **Records of masonry to be repaired:** Before starting work, use measurements and photographs as appropriate to record bonding patterns, joint widths, special features, etc.
3. **Identification of masonry units to be removed, replaced or repaired:** Mark clearly, but not indelibly, on face of masonry units or parts of units to be cut out and replaced. Transcribe markings to drawings/ photographs.

120 Site inspection

1. **Purpose:** To confirm type and extent of repair/ renovation/ conservation work shown on drawings and schedules and described in survey reports.
2. **Parties involved:** Contractor, Foreman Mason, Contractor's Architect and Structural Engineer, Client Representative and Project Manager
3. **Timing:** To suit contractor's programme of work, and at least 10 working days before starting each section of work
4. **Instructions issued during inspection:** Confirm in writing, with drawings and schedules as required, before commencing work

125 Removal of fittings/ fixtures

1. **Items to be removed, and reinstated on completion of repair work:** All items fixed to fabric indicated for reuse
 - 1.1. **Identification:** Attach labels or otherwise mark items using durable, non-permanent means, to identify location and describe refixing instructions, where applicable.
 - 1.2. **Treatment following removal:** as indicated on drawings/ schedules
 - 1.3. **Storage:** Protect against damage, and store until required.
 - 1.3.1. **Storage location:** on site
 - 1.4. **Reinstatement:** Refit in original locations using original installation methods.
2. **Items unsuitable or not required for reuse:**
 - 2.1. **Disposal:** To be disposed of appropriately, recycling materials accordingly to reduce landfill. Disposal of materials to be in accordance with the Site Waste Management Plan (SWMP).
3. **Masonry fabric and surfaces:** Do not damage during removal and replacement of fittings/ fixtures.

130 Removal of plant growths from masonry

1. **Plants, root systems and associated soil/ debris:** Carefully remove from joints, voids and facework.
2. **Removal of roots:** Where growths cannot be removed completely without disturbing masonry seek instructions.
3. **Unwanted plants close to masonry:** Where removal of root system is not possible or desirable, cut through stem as close to the ground as possible. Remove bark from stump and apply herbicide paste. Leave stump to wither.

140 Record of work

1. **General:** Record work carried out to masonry clearly and accurately using written descriptions, sketches, drawings and photographs, as necessary.
2. **Specific records:**
 - a. Annotated elevation drawings to identify the location of each individual repair.
 - b. Photographs of damaged areas prior to removal of any material.
 - c. Sketches and drawings for each unique item to be replaced, fully dimensioned.
 - d. Photographs of each repair area following removal of the material.
 - e. Photographs of the finished repair.

All information is to be cross referenced and fully annotated.

3. **Documentation:** Submit on completion of the work.

Workmanship generally

150 Power tools

1. **Usage for removal of mortar:** **Under no circumstances will the use of mechanical tools be permitted (disc cutters etc.)**

There are power tools that use oscillating blades (Fein saw type) to rake out fine joints; care must be taken with these, especially if the masonry is softer than the mortar, as the blade can slide off the mortar and cut into the masonry.

165 Structural stability

1. **General:** Maintain stability of masonry. Report defects, including signs of movement that are exposed or become apparent during the removal of masonry units.

170 Disturbance to retained masonry

1. Retained masonry in the vicinity of repair works: Disturb as little as possible.
2. Existing retained masonry: Do not cut or adjust to accommodate new or reused units.
3. 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

1. Skill and experience of site operatives: Appropriate for types of work on which they are employed.
 - 1.1. Documentary evidence: Submit on request.

181 Workmanship - Conservation Specific

1. All work shall comply with the general recommendations of B.S. 5390 section 5 Work on Site.
2. NOTE: Masonry repairs are to be undertaken only by an approved stone mason who is a member of The Heritage Contractors Section of the Stone Federation. None registered companies or unqualified personnel will not be permitted to work on site. Contractors must provide references and case studies from projects undertaken within the last 3 years.
3. Protection of Masonry Units and Masonry:
 - 3.1. 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.
 - 3.2. Masonry: Prevent damage, particularly to arrises, projecting features and delicate, friable surfaces. Prevent mortar / grout splashes and other staining and marking on face work. Protect using suitable non-staining slats, boards, tarpaulins, etc. Remove protection on completion of the work.
4. Setting Out and Working Drawings:
 - 4.1. For repair work setting out points are to be taken from the existing structure prior to carrying out repair work. Survey reference points should be taken and recorded to enable the correct placement of repairs.
 - 4.2. The Architect is to be advised of any discrepancies in the alignment of existing work prior to carrying out repair work.
 - 4.3. Working drawings for each elevation are to be prepared and submitted to the Architect at least two weeks before cutting stonework.
 - 4.4. Full size profiles of all mouldings are to be submitted to the Architect prior to carving all of which is to be shown in the pre-contract programme.
 - 4.5. The cutting schedule for all stones is to be submitted to the Architect on request.

185 Adverse weather

1. General: Do not use frozen materials or lay masonry units on frozen surfaces.
2. Air temperature: Do not bed masonry units or repoint:
 - 2.1. In cement gauged mortars when ambient air temperature is at or below 3°C and falling or unless it is at least 1°C and rising, unless mortar has a minimum temperature of 4°C when laid and the masonry is adequately protected.
 - 2.2. 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.
 - 2.3. In nonhydraulic lime:sand mortars in cold weather, unless approval is given.
3. Temperature of the work: Maintain above freezing until mortar has fully set.
4. Rain, snow and dew: Protect masonry by covering during precipitation, and at all times when work is not proceeding.

5. Hot conditions and drying winds: Prevent masonry from drying out rapidly.
6. New mortar damaged by frost: Rake out and replace.

Materials/ production/ accessories

215 Material samples

1. Representative samples of designated materials: Submit before placing orders.
 - 1.1. Designated materials: Representative samples of stone for repairs as C41 / 242 for final selection
Dressed stone as C41 / 242
Tooled stone as C41 / 242
2. Retention of samples: Unless instructed otherwise, retain samples on-site for reference. Protect from damage and contamination.

220 Recording profiles

1. Profiles: Take measurements from existing masonry units, as instructed, to allow accurate matching of replacements.
2. Recording in situ: If there are no suitable joints to allow use of inserts, seek instructions.
3. Drawings and templates: Prepare as necessary. Templates must be clearly and indelibly marked to identify use and location.

242 Stone

1. Stone and masonry:
 - 1.1. Stone is to be selected to closely match existing in texture and colour. British Geological Society Stone Survey and Building Stone Assessment GeoReport to be procured to determine existing stone types and geologically compatible and currently available stone for stone repairs/ replacements.
 - 1.1.1.NOTE: The survey is to include both the City Art Gallery Building and the Athenaeum as stone types may differ.
 - 1.2. Contractor is to liaise with the stonemason to provide appropriate samples based on the results of the GeoReport for approval by the architect conservation officer prior to commencement of works.
 - 1.3. Representative samples shall be provided prior to final order. Samples should be weathered samples from all areas of the quarry currently being exploited as there may be colour/texture variations between beds within the quarry.
 - 1.3.1.Variations in colour and texture, natural to the source of stone, will only be acceptable within the range of samples supplied to and approved by the Architect. Variations in colour and texture outside the range of approved samples will be rejected.
 - 1.4. Samples to be of proven durability and weather resistance and selected with regard to its suitability to local atmospheric conditions and the nature of the work to be carried out, and its location in the finished work. The Contractor is to confirm to the Architect the suitability of the stone.
 - 1.5. Where dressed stone is to be used then samples of new stone with a dressed face shall also be provided for approval.
 - 1.6. Where stone has a tooled face then samples of new stone with a tooled face shall also be provided for approval.
 - 1.7. Whilst provisional orders may be placed no confirmation shall be issued until samples have been approved by the Architect.
 - 1.8. Stone is to be seasoned at the time of delivery to suit the purpose for which it is to be used.

- 1.9. All stone shall be free from vents, cracks, fissures, mineral veins, discoloration, and clay pockets. No stone for the project should contain any defect which will adversely affect the strength or appearance of the stone.

245 Replacement stone units

1. **Sizes and profiles:** To match existing masonry. Maintain existing joint widths.
2. **Sinkings for fixings, joggles and lifting devices:** Accurately aligned and positioned in relation to existing masonry.
3. **Marking:** Mark each block/ dressing clearly and indelibly on a concealed face to indicate the natural bed and position in the finished work.

251 Laying of stone

1. Natural bed:
 - 1.1. New stonework shall be prepared such that the natural bed is:
 - a) Horizontal for plain walling works.
 - b) Vertical and at right angles to wall face for cornices and other projecting stones.
 - c) Horizontal in quoin stones or end stones. These shall be specially selected to ensure that they are compact non-laminated stones.
 - 1.2. Further bedding details are contained in B.R.E. publications for the relevant type of stone.

252 Bedding

1. All stones shall be laid on a full and even bed of lime mortar as specification section BUT07

253 Joints

1. Horizontal and vertical joints are to match the existing joint size unless instructed differently by the Architect.

254 Face

1. Stones are to be placed such that their face is flush with the plane of the original stonework. Where new stone is being inserted adjacent to old worn surfaces the new stone shall be set to the face of the nearest unworn surface.

255 Ashlar blocks/ Dressings

1. **Cutting and dressing stone:** To true and regular surfaces, free from hollow or rough areas.

281 Dowels and Cramps

1. **Description:** Dowels, cramps and the like to be grade 316 Austenitic stainless steel or phosphor bronze grouted in with lime mortar or a lead pour between the stone and fixing.
2. **Manufacturer:** All dowels and cramps are to be as manufactured by Ancon Clarke Ltd
 - 2.1. **Address:** Olive Grove Road, Sheffield. S2 3GB.
3. **Type:** Submit proposals.
4. **Material:** Grade 316 austenitic stainless steel to BS 1449-2:1983 or as updated
 - 4.1. **Alternative:** Phosphor bronze cramps may also be used subject to prior written approval.
5. **Size, strength and number:** As necessary to resist loads likely to occur during the life of the building, and to prevent lateral displacement or pulling apart of the construction.
6. **Fixing:** Dowel/ cramp to be grouted in with lime mortar or a lead pour between the stone and fixing

282 Resin

1. All resins shall be approved in writing before use. The Contractor is to supply full technical details of proposed resins with their tender.

283 Water

1. Water for the works shall be clean and fresh without pollutants. Where existing water supply is available within the building this may only be used with the Employers permission. In other cases, a lockable standpipe shall be erected to the approval of the local water authority.

284 Mortar

1. Lime mortar as BUT07

Dismantling/ rebuilding

310 Dismantling masonry for reuse

1. **Masonry units to be reused:** Remove carefully and in one piece.
 - 1.1. **Treatment:** Clean off old mortar, organic growths and dirt, and leave units in a suitable condition for rebuilding.
 - 1.2. **Identification:** Mark each unit clearly and indelibly on a concealed face, indicating its original position in the construction. Transcribe makings to drawings/ photographs.

320 Rebuilding

1. **Description:** To lightwell 'bridges' to Athenaeum (Princess St) and City Art Gallery (Nicholas Street) as indicated on MAG-BUT-14-XX-DR-A-00-0005 & MAG-BUT-14-XX-DR-A-00-0001 respectively
2. **Replacement materials:**
3. **Brick :** as BUT08 / 100
4. **Stone:** as C41 / 242
5. **Mortar:** As section BUT 07
 - 5.1. **Standard:** As section BUT 07
 - 5.2. **Mix:** As section BUT 07
 - 5.3. **Sand source/ type:** As section BUT 07
6. **Fixings:** Cramps and dowels as C41 / 281
7. **Rebuilding:** To match previous face and joint lines, joint widths and bonding. Adequately bonded to retained work/ backing masonry, as appropriate.
8. **Joint surfaces:** Dampen, as necessary, to control suction.
9. **Laying masonry units:** On a full bed of mortar; perpend joints filled.
10. **Exposed faces:** Remove mortar and grout splashes immediately.
11. **Joints:** to match existing
12. **Other requirements:** Refer to Structural Engineer's documentation for repair works to supporting structure

Replacements and insertions

331 Repairs to stonework

1. **General:**
 - 1.1. All repairs will be identified during the inspection and will be indicated on the drawings.

- 1.2. All areas for repair are to be marked up from the drawings on site by the Contractor and agreed with the Architect prior to commencing cutting out.
2. Cutting Out
 - 2.1. Cutting out decayed stonework to permit new stones of the specified depth for the appropriate repair to be inserted.
 - 2.2. Stonework is to be cut out with extreme care to ensure that no damage occurs to existing adjacent stones that are to be left in-situ. This work should be undertaken by skilled stonemasons only.
 - 2.3. If cutting is to be undertaken by mechanical means, stones should be cut to the central sections only ensuring that the perimeter is undamaged. The stone is then to be cut back by hand to the required depth.
 - 2.4. Where the Contractor anticipates that cutting out will not be possible without causing damage, the Architect is to be advised and provided with a method statement describing how potential damage will be controlled before proceeding with the work.
 - 2.5. In certain areas previous plastic repairs may have to be removed. In this case the Contractor should note that the plastic repair may be harder than the original stonework and great care is to be exercised to ensure no unnecessary damage occurs to the existing stone.
3. Cleaning Out
 - 3.1. All areas cut out to be cleared of debris mortar etc. and washed clean. Care is to be taken not to saturate the stone.
Any defects noted in the stone after cutting back or in the masonry backing are to be reported to the Architect.
4. Moistening
 - 4.1. Wherever new masonry is to be inserted the adjoining stones are to be moistened to ensure that the mortar does not "snatch". Do not saturate the stone.
5. Temporary Support
 - 5.1. Stonework is to be adequately propped during the course of the works. Care should be taken to ensure that no damage is caused by props to the adjoining stonework.
6. Existing Ferrous Cramps
 - 6.1. Where iron cramps are encountered during the course of the works they are to be brought to the attention of the Architect. Unless instructed otherwise they are to be removed and replaced with non-ferrous cramps.
7. Repair techniques:
 - 7.1. Repairs to stonework will be one of the following as noted on the work package 14 and 15 drawings:
 - 7.1.1.A) Full block replacement.
 - B) Part block replacement.
 - C) Full face replacement
 - D) Partial face replacement
 - E) Carved work replacement.
 - F) Carved item replacement
 - G) Indent repair
 - H) Redressing
 - I) Crack injection/resin repair
 - J) Stitch repair
 - K) Plastic repair
 - 7.1.2. Note: lettered abbreviations A-K as above are annotated in the drawing keys where relevant.
 - 7.1.3. Each repair technique is described below.

331 (A) Full block replacement (A)

1. Preparation:
 - 1.1. The existing stone block is to be cut out to its full depth and the backing masonry inspected.
2. Installation:
 - 2.1. New stone is to be inserted on a bed and backing of 1:2:9 cement lime sand mortar. Mortar is to be kept back 25mm from the face of the stone to allow for later pointing.

331 (B) Part block replacement (B)

1. Preparation:
 - 1.1. The existing stone block is to be cut out to an agreed line or as shown on the drawing to its full depth. The remaining edge of the block is to be hand dressed to form a new arris ensuring that the adjoining stones are not damaged in any way for ashlar work. The arris is to be formed perfectly plumb and true and at right angles to the face of the block. The backing masonry is to be inspected and any defects reported to the Architect. The backing masonry is to be drilled to receive resin anchors and the adjoining stones drilled to receive dowels.
2. Installation:
 - 2.1. New stone is to be bedded in lime mortar and cramped and doweled in position.

331 (C) Full face replacement (C)

1. General:
 - 1.1. Where the stone is of sufficient thickness a 100mm indent repair is to be used. This repair may not be used on stone less than 200mm thick and in circumstances where the existing stone thickness varies the Contractor is to inform the Architect when the remaining thickness of the stone after removal of the face is less than 100mm.
2. Preparation:
 - 2.1. Existing block is to be cut back to a depth of 100mm from the front face of the surrounding stonework.
 - 2.2. The existing stone is to be drilled to receive resin anchors and the adjoining stones drilled to receive dowels.
3. Installation:
 - 3.1. The new stone slab is to be bedded in hydraulic lime mortar and cramped and doweled in position. The mortar bed is to be kept back 25mm to allow for pointing.

331 (D) Partial face replacement (D)

1. General:
 - 1.1. Where the stone is of sufficient thickness a 100mm indent repair is to be used. This repair may not be used on stone less than 200mm thick and in circumstances where the existing stone thickness varies the Contractor is to inform the Architect when the remaining thickness of the stone after removal of the face is less than 100mm.
2. Preparation:
 - 2.1. The existing block is to be cut back to a depth as agreed with the Architect or as indicated on the drawings to a depth of 100mm from the face of the surrounding stonework. A new arris is to be formed by hand in the position agreed for ashlar work. The arris is to be plumb and true and square to the face of the stone.
3. Installation:
 - 3.1. The existing stone is to be drilled to receive resin anchors and the adjoining stones drilled to receive dowels.
 - 3.2. New stone slab is to be bedded in hydraulic lime mortar and cramped and doweled in position. The mortar bed is to be kept back 25mm to allow for pointing.

331 (E) Carved work replacement (E)

1. General:
 - 1.1. Where carved or projecting stones are identified for replacement, the decayed stone shall be cut back to a depth which will ensure that the centre of gravity of the stone to be inserted is contained within the line of the masonry wall. The minimum depth is to be 100mm, but the Contractor is to allow within their rates for any increased depth required to suit individual profiles.
2. Preparation:
 - 2.1. The section of decayed stonework is to be cut back to the lines agreed with the Architect and cleaned out of all debris and mortar and rinsed out with clean water.
 - 2.2. Any defect in the remaining stone is to be reported to the Architect.
3. Installation:
 - 3.1. New stone may be carved prior to placing but must be finished after placing to ensure satisfactory junction with the adjoining stones. Stone is to be bedded in lime mortar unless specified elsewhere and mortar is to be kept back 25mm from the face to facilitate later pointing.
 - 3.2. Backing stone is to be drilled to receive resin anchors and stainless-steel cramps and adjoining stones are to be drilled to receive dowels as detailed below. If the specified cramps and dowels cannot be achieved the Contractor is to advise the Architect is to instruct on alternatives after the decayed area has been cut out.

331 (F) Carved item replacement (F)

1. General:
 - 1.1. Where an entire item of carved work is specified for replacement then the original decayed item shall be carefully cut out, any existing dowels, cramps, etc are to be removed.
 - 1.2. New stone is to be specially selected for its compactness and is to be worked to the required profiles.
2. Installation:
 - 2.1. New stone may be carved prior to placing but must be finished after placing to ensure satisfactory junction with adjoining stones. Stone is to be bedded in lime mortar as specification, unless specified elsewhere and the mortar is to be kept back 25mm from the face to facilitate later pointing.

331 (G) Indent repair (G)

1. General:
 - 1.1. Cut out area of stone identified to a depth of 50mm for indents of 100mm, 65mm for indents up to 150mm and 75mm for indent repairs to a maximum of 300mm.
2. Preparation:
 - 2.1. Carefully form neat arrises to all sides ensuring that no damage occurs to the adjoining stones. Carefully square off the back of the recess and clean out all debris, mortar etc.
3. Installation:
 - 3.1. New stone is to be inserted on a bed of resin with arrises tight to the original stone. Joint thickness to the original arrises of the block is to be consistent with the original mortar joints.
 - 3.2. Ensure that resin is kept back from the mortar joint positions by 25mm to facilitate later pointing.
 - 3.3. Indent repair is to be fully supported until the resin has cured.

331 (H) Redressing (H)

1. General:

- 1.1. Where damage to stone is superficial this can be rectified by redressing the stone. The area to be redressed is to be agreed on site during inspection period.
- 1.2. When surface failure has occurred, the stonework can be redressed to its original profile. This should be undertaken by a skilled stonemason's. Generally, only 15-25mm of the eroded stone is removed to allow realignment to the original profile. This technique is used for eroded stone deeply embedded within a wall which itself has minimal decay, yet is disfigured.
- 1.3. The redressing of stonework will generally remove all spalling / friable / sheered areas of masonry vulnerable to becoming loose.
2. Preparation:
 - 2.1. The stone is to be taken back the minimum possible to achieve a sound free draining surface using only hand tools.
 - 2.2. On many stones, a more robust descaling will be necessary due to the extent of delamination. This work is to be carried out in accordance with previously agreed samples. A sample is to be provided so that the contractor understands the extent of descaling necessary to some stones.
 - 2.3. Where dressing back is required the Contractor shall inform the Architect if, in their opinion, it is necessary to dress back further, i.e. to a greater depth, than specified. Must be agreed.
3. Finish:
 - 3.1. The redressed stone shall be finished to a smooth texture with minimum tooling marks visible. However if the existing stone had a tooled face, the new stone will be tooled to match the original detail.
 - 3.2. Where it is agreed that only part of the stone is to be redressed the redressed area is to be feathered neatly into the untreated area.

331 (I) Crack injection / resin repair (I)

1. General:
 - 1.1. Resin repairs will only be used in limited areas where the blocks exhibit minor cracks that do not warrant the replacement of the whole block.
2. Materials:
 - 2.1. Resin: Resin shall be Jolly Stone Filler / Glue as manufactured by Ilpa or similar approved, colour to match existing stone
 - 2.2. Natural Pigments (black or brown) – obtainable from Womersley's of Heckmondwike.
3. Preparation:
 - 3.1. Any loose material is to be scraped away using a hacksaw blade and the joint widened sufficiently to accept the resin and washed out with a syringe and clean water to remove all dust and debris.
4. Installation:
 - 4.1. Resin is to be applied into the crack and finished flush with the surface of the stonework. It is important to ensure that the resin is applied to the full depth of the crack and that it is completely filled. The stone is then to be lightly polished using carborundum pads to provide a smooth finish. No resin should be visible on the surface of the stonework.
 - 4.2. A sample of the above process is to be prepared on a defective cut out block for the approval by the Architect prior to commencing this type of repair.
 - 4.3. Where the crack is too wide to be repaired with resin then the crack shall be filled with 1:2:9 cement: lime: sand mortar pushed back firmly into the crack ensuring that the crack is completely filled.
 - 4.3.1. The use of mortar repairs rather than resin is to be subject to the Architects approval.

331 (J) Stitch repair (J)

1. Where specified the adjoining joints to both sides of the defect are to be raked out to a depth of 50mm (or as specified by the structural engineer) and to at least 450mm beyond the line of the defect.
2. Raked out joints are to be cleaned out of all debris.
3. Helical stainless-steel tie rods are to be inserted into the joints at the specified centres.
4. Joints are to be fully repointed with all mortar fully compacted and pointed to match the surrounding masonry.

331 (K) Plastic repair (K)

1. General:
 - 1.1. Plastic repairs will normally not be used except in exceptional circumstances. It is essential that any plastic repair is correctly carried out to avoid damage to the adjoining stonework.
2. Preparation:
 - 2.1. Decayed and damaged stone is to be cut back to a minimum depth of 25mm from the face of the original stonework, or until sound stonework is located whichever is deeper. All loose material debris and mortar is to be removed and the recess thoroughly cleaned. The recess is to be rinsed in clean water.
3. Installation:
 - 3.1. Repair is to be carried out using a plastic mortar consisting of hydraulic lime and stone dust. Samples of repair mortar are to be prepared and approval obtained prior to commencement of repairs. The mix is to be adjusted to ensure that, when dry, the mortar matches the existing stone in colour and texture. The mortar mix should be softer than the stone to avoid future damage.
 - 3.2. Stainless steel reinforcement is to be secured with resin into the recess and the resin allowed to cure before commencing the repair.
 - 3.3. Moisten the recess and build up in maximum 10mm thick layers of repair mortar, to the required depth allowing each layer to cure before applying the next. The last layer shall be finished to profiles to match the adjoining stone.

347 New stonework

1. Quoins are to be sized as specified and cut from one piece of stone unless specified otherwise.
2. Cills are to be sized as specified, cut from one piece of stone unless specified otherwise.
3. Jambs are to be sized as specified. Full section to be cut from one piece of stone unless specified otherwise.
4. Copings to be sized as specified. Full section to be cut from one piece of stone unless specified otherwise.
5. No work involving preparation or laying of mortar shall be carried out during frost conditions.

348 Laying and jointing

1. Lay stones on their natural bed, or as described in clauses for "Preparation of the Stone".
2. Lay stones on a full even bed of mortar, as agreed sample. Ensure that no hard lumps or the like are present in the mortar that could prevent even bedding.
3. In repair work, horizontal and vertical joints are to be of widths to match the original masonry, finished as approved sample, unless specified otherwise. An area of existing masonry will be marked up by the Architect for matching purposes.
4. In new work horizontal and vertical joints are to be of widths to match the approved sample or as specified otherwise. Joints to be finished as approved sample.
5. Ensure stone faces taking mortar are dampened as necessary to prevent premature drying out of the mortar.

6. All joints and joggles are to be filled solid.
7. All dowels, cramps, ties, metal fixings and the like are to be solidly and securely fixed as the work proceeds.
8. Random rubble wall to be laid as specified and to match existing and adjacent.
9. Coursed random rubble to be levelled at heights as specified and to match existing and adjacent.

Tooling/ dressing stone in situ - Not Used

Mortar repairs - Not Used

Crack repairs/ ties/ reinforcement - Not Used

Grouting rubble filled cores - Not Used

Pointing/ repointing

900 Completion

1. The Architect is to be advised at least two weeks in advance of when the works will be complete in order that an inspection can be made prior to the removal of any scaffold.
2. All dust marks, staining, scuff marks and the like are to be carefully cleaned off. Extreme care is to be taken to ensure that no damage occurs to the new or existing fabric of the building. Any damage is to be made good at the Contractor's own expense.
3. Remove all tools, plant and equipment and used materials and debris.
4. On completion leave all neat and tidy to the satisfaction of the Architect.

Ω End of Section



Specification created using NBS Chorus