Bath Abbey

North quire aisle:
Proposed new window depicting St.Alphege

Supporting documentation

1280-08: July 2024 – for approval

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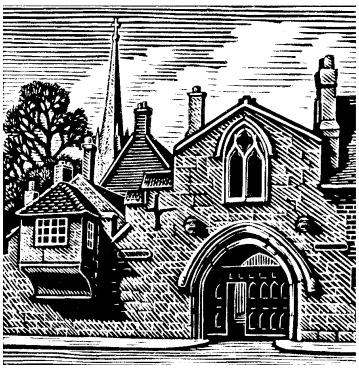

766-74/ACFK

July 4th 2024

Bath Abbey: Proposed new St.Alphege Window

ABBEY ARCHITECT'S NOTE – for approval

1.00 BACKGROUND

1.01 This project relates to the installation of a new stained glass window into one of the eastern-most windows of the Abbey's north quire aisle. The window depicts St.Alphege, and has been designed by stained glass artist Neil Ireson, who will also make and install the new window. This project is the subject of an application for Faculty approval from the Diocese of Bath & Wells.

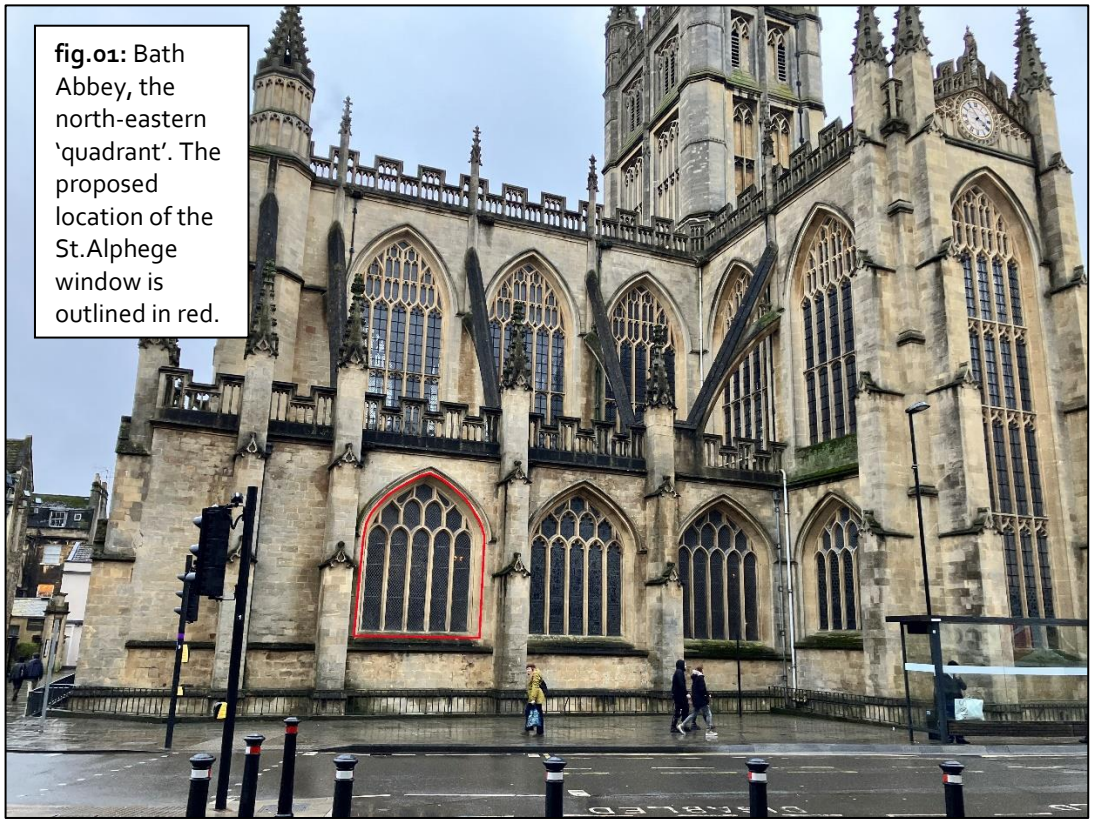

fig.01: Bath Abbey, the north-eastern 'quadrant'. The proposed location of the St.Alphege window is outlined in red.

1.02 The artist has provided separate documents which set out the inspiration and thinking behind the design, and also some technical detail around the installation of the window. The window will be installed by a skilled and experienced stained-glass specialist.

1.03 This document covers the other elements of the project, such as the potential works to the masonry framework of the window in question, and some of the technical detail, appropriate to this exciting new addition to the fabric of the Abbey.

2.00 LOCATION

2.01 It is intended to install the window into north-facing 'plain-glazed' window at the eastern end in the north quire aisle (see figure 01).

2.02 This location relates well to the Abbey's 'prayer chapel', a space set aside for prayer, either as individuals or in groups, located at the eastern end of the north quire aisle. This is appropriate as a subsidiary theme in the window is the Abbey as a 'House of Prayer for All Nations'.

3.00 CONDITION OF THE FABRIC

3.01 The 2023 Quinquennial Inspection Report notes that, in the main, the masonry and the glazing of the Abbey church building is in excellent condition. This is a result of careful repair and care over many decades. In some areas, notably on the southern side of the building which is more exposed to the prevailing weather, ferramenta are corroding slowly, and a gradual programme of access, de-rusting, and re-decoration, is recommended. However, none of the windows were categorised as being in a poor state, worthy of urgent remedial attention.

3.02 Specifically in relation to the part of the Abbey in question for this project, the 2023 QIR notes the following (using the numbering system from the report):

- 3.06.01 The masonry of this part of the building is in very good condition, save for some vegetation growing in the lowest part of the openwork parapet in the central bay, and the ubiquitous moss gathering on the upward facing cills, which should be removed.
- 3.06.02 Of the three windows here, the central one is a stained-glass window whilst the other two are diamond-paned leaded-lights. All three windows have internal ferramenta.

3.03 Consequently there are no significant concerns regarding the condition of the masonry of this window, nor its adequacy in relation to its ability to support the new stained glass panels.

3.04 The technical specification and schedule of works therefore provide a description of techniques to be used when de-glazing and re-glazing the window, to be read alongside the stained glass artist's proposals, as well as providing general advice on what techniques could be applied to the window if masonry was found to be in need of repair on removal of the existing glazing.

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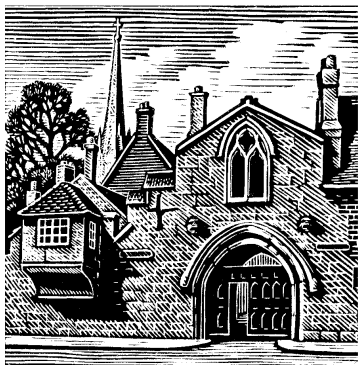

766-74/ACFK

July 5th 2024

Bath Abbey: Proposed new St.Alphege Window

SCHEDULE OF WORKS – for approval

NB: to be read in association with technical specification and other documents provided by the artists

ref:	item:	cost:
1.00	**PRELIMINARIES ETC.**	
1.01	Site set-up and security arrangements	
1.02	Insurances: Provide evidence of contractor's 'all-risks' and public liability insurance with tender – cover £5,000,000	
1.03	CDM Regulations: Compile contract phase health and safety plan in response to pre-contract information. Principal Contractor under CDM to issue formal F10 notification to the HSE.	
1.04	General contingency	tba
1.05	Specific provisional sum to cover minor masonry repairs	tba
2.00	**ENABLING WORKS**	
2.01	External scaffolding: Construct safe scaffolding to access the area of the works required on the northern side of the north quire aisle. Note that, due to the extreme height of the scaffolding, building-in of scaffolding or use of Hilti ties may be permitted, but only with the express agreement of the CA.	
2.02	Hoarding and debris netting: Ensure all external scaffolding is secured at ground level within a 4m high solid hoarding. Ladder access must be removed at the end of each working session. Above hoarding level, fix debris netting neatly to scaffolding to enclose entire scaffolded area.	

2.03	Note: Care must be taken at ground level to avoid any blockage of drainage gulleys in the 'dry area' surrounding the Abbey.	
2.04	Alarm: Allow here for scaffolding alarm to external areas: Monitoring will be the responsibility of the contractor.	
2.05	Internal scaffolding: Construct internal scaffolding sufficient to provide access to the working area. Agree layout with CA and Abbey Authorities before erection. Design, loadings and any bearing points must be agreed with Abbey's consulting structural engineer before works commence.	
2.06	Extreme care must be taken when bringing scaffolding tube and other materials into the interior. At floor level, the internal pavement must be protected using a double layer of clean 18mm ply boarding. Scaffolding feet must be located onto a double layer of scaffolding boards to ensure a spread of load. Enclose lowest lift of scaffolding in secure hoarding to ensure no unauthorised access is possible.	
3.00	**GLAZING WORKS**	
3.01	**Removal**	
3.01.01	Record window photographically to provide overall record of existing leaded-lights to be removed.	
3.01.02	Carefully de-glaze entire window starting from the top and moving downwards. Remove existing ferramenta.	
3.01.03	Once at ground level, leaded light panels are to be inserted into purpose-made crates intact, to allow storage of glass for future repair projects. Crates will be removed to the Abbey's secure off-site storage facility.	
3.01.04	While window is ex-situ, protect opening as specified. (It is not anticipated that the lights will be open to the elements for a protracted period of time.)	
3.01.05	Carry out basic cleaning of masonry to window, inside and out, as specified at specification clause FX/20. Deeper cleaning methods (ie FX/30 onwards) will only be deployed if required to address particularly soiled areas.	
3.02	**Works to masonry**	
3.02.01	With glazed panels removed, carry out joint inspection of masonry with CA.	
3.02.02	The glazing rebate will be thoroughly cleared of mortar etc. an then checked for integrity and size, as relevant for the installation of the new stained glass panels. No enlargement is considered necessary.	
3.02.03	Carry out masonry repair and conservation works as required and agreed with CA on site. (It is not anticipated that significant works will be required. Specification clauses provide technical detail on an 'if required' basis.)	

3.03	**Installation of new glass**	
3.03.01	The artist has provided a description of the installation process, which will be undertaken by a highly skilled and experienced stained-glass installer.	
3.03.02	New stainless steel ferramenta will be provided, which will suit the design and pattern of lead lines and panel divisions of the of the new window.	
3.03.03	The position of these new bars will be agreed with the CA on the scaffolding, and the former bar end apertures will be made good using lime-based mortar to match the host stone.	
3.03.04	Install code four lead trays at the foot of each light, c/w condensation channel to direct any condensation to the exterior.	
3.03.05	The specialist installer will install the new glass panels, using traditional techniques, from the bottom up.	
3.03.06	The glazing fillet will be formed using lime-based mortar as specified.	
3.03.07	The ferramenta will be painted matt black, matching other ferramenta elsewhere in the building.	
4.00	**ON COMPLETION**	
4.01	Clear site and clean all areas. Again, extreme care must be taken when removing scaffolding tube and other materials from the interior.	
4.02	Stonemasonry conservator to make good any temporary fixing points as scaffolding is removed.	
4.03	Submit health and safety file to CA for approval.	
total ex.VAT		
VAT		
gross total		

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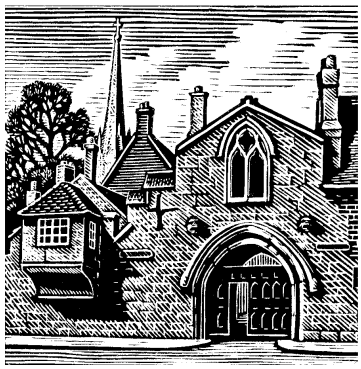

766-74/ACFK

July 4th 2024

Bath Abbey: Proposed new St.Alphege Window

SPECIFICATION – for approval

to be read in conjunction with the preliminaries, schedule of works, drawings, CDM information etc.

FX MATERIALS AND TECHNIQUES TO BE USED IN THE CLEANING, REPAIR AND CONSERVATION OF LIMESTONE MASONRY (if required)

10 Conservation Cleaning Methods:
Use a combination of the following techniques to achieve the best balance of cleaning, as agreed on site with the CA.

20 Dry brush and vacuum
Use a hand-held brush to loosen surface dirt and remove by vacuum.

30 'Thermatech' hot water cleaning system
Clean stonework surfaces using temperature control set at maximum of 150 ˚C, max pressure of 30 bars. Check that all moss, algae, lichens and superficial dirt can be removed without damaging stonework surface. May also be used to rinse off residue for other techniques.

40 Poultice
Clay and paper poultice with active ingredients such as ammonium carbonate or EDTA. Establish dwell time via trials.

50 Heavy duty latex poultice
Contains EDTA and is applied as a thick paste (2-4mm) to heavily discoloured areas. Remove by peeling away. Rinse with warm water and sponge.

100 Removal of existing cement based pointing and previous repairs

- All Portland cement-based re-pointing and repairs from the earlier phases are to be removed. As a general rule all cement removal to be carried out by hand using a hammer/dummy and sharp tungsten chisels.
- NB: Angle grinders must not be used.
- Cement bedding/jointing mortar around 19th and 20th century replacement stonework to be retained, as removal may cause more harm than good, unless otherwise instructed by CA.

110 Iron Removal

Any embedded ironwork currently causing damage, or likely to cause future damage, is to be carefully removed. Mechanical techniques are restricted to masonry 'stitch' drilling; disc cutters and hand grinders must not be used. Again, such removal must be discussed with the CA before any removal work commences and express approval given.

120 Pinning and Dowelling of new and existing masonry

All pinning and dowelling to be carried out using threaded stainless steel rod (grade 316) or keyed phosphor bronze set in either fine non-hydraulic lime mortar or hydraulic lime for non-structural work and polyester resin for structural work.

F21 NATURAL STONE ASHLAR WALLING, DRESSINGS AND DECORATIVE FEATURES

To be read with preliminaries, general conditions and drawings.

NB: No major replacement of stonework is envisaged at this stage. However, where new localised renewal is required, then the following specification is to be used:

10 ALL REPLACEMENT STONEWORK, as agreed on site where absolutely necessary:

- **Size of worked stone**: replacement stone shall be worked to match the existing stones withdrawn from the fabric.
- **Finish**: tooled to match existing. Where required, final working, tooling and finishing will be carried out on site to ensure that the new work aligns correctly with the existing historic fabric surfaces to the approval of the CA. On no account should these existing historic fabric surfaces be dressed in-situ, dragged or otherwise worked in any way.
- **Stone Suppliers: Note:** Sample of intended bed to be used to be approved by CA before any bulk orders placed.
- For new stone details:
- **Box Ground Bath Stone**
- Supplier: Lovell Stone Group:
  Head Office: Downs Quarry, Kingston Rd, Langton Matravers, Swanage, Dorset, BH19 3JP
- **Mortar**: As mortar specification section Z21.
- **Bond**: As existing.
- **Joints**: Flush, brushed and/or sponged to bring aggregate to surface.
- **Features**: Cutting to allow for cramping and joggles as necessary.

GENERAL REQUIREMENTS/PRODUCTION

20 ADVANCE REGISTRATION

Obtain stone from the supplier(s) specified. Take responsibility for supply, quality and delivery to suit the progress of the work.

30 OPERATIVES

Cutting, dressing, laying and jointing of stone to be carried out by skilled stonemasons only. Provide documentary evidence of previous experience and details of comparable work carried out to date.

40 PRODUCTION

- Ashlar stone to be cut and dressed:
- After seasoning but before delivery to site, including shaping, finish(s) and all sinkings for fixing and lifting devices except where final working, tooling and finishing is directed to be carried out on site by the CA.
- So that exposed and joint surfaces generally are square, true planes free from hollow or rough areas.
- With minimal deviation from specified dimensions to ensure that specified joint widths are maintained.

- So that natural bed is horizontal in plain walling, vertical and at right angles to wall face in projecting stones (i.e. edge bedded) and at right angles to line of thrust in arches.

45 - DEVELOPMENT OF CARVED DETAIL

- Skills and experience of stonemasons to be allocated to this task to be presented to design team at outset, for comment and approval.
- Senior stonemason to take responsibility for development of accurate and appropriate mouldings/profiles for new work, based on evidence available from the building itself, from historic photographs and drawings (large scale copies will be made available), other similar details on the Abbey church building.
  It is important to arrive at working dimensions and forms by checking from different examples of the same masonry feature, i.e. do not take measurements in isolation. Use various means of measurement, in particular callipers, sinking squares and depth gauges.
- Drawings and other research to be presented to CA for comment before moving on to next stage.
- Masons to then develop 3D representations of proposed new detail, using clay formed onto existing stone in-situ, and/or forming polystyrene 'models' for approval.
- Resulting maquettes to be presented to CA and client for comment before moving on to next stage.
- Allow for one further 'iteration' of the above process.
- Obtain CA written approval of final maquette before moving on to carve the final stone for fixing on the building.

50 IDENTIFICATION

Mark each block/dressing clearly to indicate the natural bed and position in the finished works.

60 INSPECTION OF STONE

All completed blocks/dressings must be carefully inspected and checked by the stone producer for match with approved sample(s) and compliance with drawings and specification before dispatch to site.

LAYING, JOINTING AND RE-POINTING

100 WORKMANSHIP GENERALLY

- Store dressed stone clear of the ground, protect from inclement weather and keep under cover at all times prior to laying. Prevent soiling, chipping and contamination by salts and other deleterious substances.
- Thoroughly 'wet up' stones and lay on a full even bed of mortar with all joints filled and to joint widths to generally match existing work adjacent. Use temporary lead or stainless steel distance pieces to ensure joint width; remove when mortar is sufficiently strong.
- Masonry shall be supported.
- Joint widths in ashlar should be between 3 mm and 6 mm: joints in hood moulds and other joints in weatherings to be between 2 mm and 3 mm.

- Joint widths in pieced work should be 3 mm maximum, feathering out to 1 mm at the surface.
- Keep courses, all wall faces, angles and features in line with existing but allowing for the weathered surfaces of the existing and to the satisfaction of the CA. Set out carefully, to ensure satisfactory junctions and joints with adjoining or built-in elements and components.
- Keep stonework clean during construction and until Practical Completion. Always wipe off all mortar runs and dribbles as they occur, then check that there is no residual 'bloom'. Ensure that no mortar encroaches on face when laying. Turn back scaffolding boards at night and during heavy rain. Rubbing to remove marks or stains will not be permitted.

POINTING AND RE-POINTING

The aim throughout is that all mortar repairs should resemble the host stone in colour and texture and be exactly in line with, yet not obscuring, it at any point.

110 RAKING OUT

- Carefully rake out the Portland cement-based mortar mixes in exposed joints, back to the lime-based bedding mortar. Use an appropriate sharp tool.
- Note that joint depth is relative to joint width rather than to a generalised specification; thus removing all mortar back to a 'standard' depth is inappropriate for the historic fabric.
- Consider if it is necessary to remove all residual cementitious pointing. Hard and well-recessed mortars may result in consequential damage during extraction; it may be less damaging to leave them in-situ and apply a shallow fill on top. A correctly mixed lime mortar can be made to adhere to relatively shallow 'facial' joints, as well as to deeply recessed joints. Confirm depth of raking out with CA in all cases prior to removal of any material.
- Take care to wear a suitable face mask during raking out operations as the cement used in some mortar repairs may be deleterious.
- Where fine joints are to be re-pointed the joints are to be raked out to a depth at least equal to the width of the joint and deeper if possible without damaging stonework, i.e. adjacent arrisses.
- Where old mortar has become sandy and de-natured or has failed it should be cleaned out and deep tamped leaving at least 25 mm for the final pointing.
- Mechanical cutting of joints is not to be undertaken without the express written permission of the CA. Well-sharpened hand tools (i.e. quirk chisels or various blade tools) of the correct width must be used so as not to damage the ancient stones or in any way widen the joints.

111 DRY BRUSHING OUT

- Clean out all debris thoroughly by brushing along each joint, or blowing out with a portable compressor unit. Remove all dust from the masonry face and remove all debris from foot of the work area before commencing wet work.

112 DAMPENING

- Use a fine mist spray (fitted to a hand-operated pump sprayer unit or hosepipe) or flick with a stock brush and bucket. Continue with a more controlled application from the pump sprayer.
- Introducing water into the work area and surrounding masonry is absolutely necessary to counter suction of water from the mortar. However, extreme care should be taken not to flood the heart of the masonry, or the lower sections of the elevation which may already be damp.
- Wet once and allow time for absorption. Re-apply as many times as is necessary, paying particular attention to the varying rates of absorption across the work area and to prevailing weather conditions. Ensure wetting extends to at least 150 mm beyond the work area for each application.

113 PREPARATION OF 'GALLETS'

- Small pieces of terracotta tile 'gallets' are to be used where areas of mortar pointing exceed 25 mm^3. The colour is to be yellow/buff/salmon pink to give a reasonable colour match to the local Cotswold stone.
- Tiles are to be handmade (i.e. not machine pressed), rough textured and frost resistant. The approved supplier is:
  Cambridgeshire Tile and Brick Co. Ltd.
- Goosehall Farm, Factory Road, Burwell, Cambs. CB5 0BN
  tel. 01638 743953
- Either new whole or breakage grade tiles from this supplier are permitted provided that they are properly fired.
- New material only is to be used as salvaged materials may be contaminated with aggressive salts.
- Tile gallets are deemed necessary for the following reasons:
  - To counter shrinkage of mortar during carbonation.
  - To give structural support to the mortar; initial application and long-term.
  - To reduce the volume and mass of mortar, thereby accelerating carbonation.
  - To economise on mortar.
- Tile gallets are to be prepared in a range of suitable sizes and shapes appropriate to the specific work area.
- Prepare gallets by breaking each tile with a hammer. Use flat and end-on blows to delaminate tile and produce gallets of varying thicknesses. Volumetric accuracy of each gallet (i.e. its precise size and shape) is vital in carrying out small tile and mortar repairs.

114 APPLICATION OF 'TACK COAT'

- Provide a 'sticky' interface to improve adherence of mortar to stone inside joint faces.
- Carefully apply tack coat to inside faces of joint and ensure uniform application.
- Allow tack coat to 'take up' and become 'cheesy' before consolidating cavities and pointing the wider joint.
- Leave all fine joints to the latter stages of the work in each section of wall or scaffold lift.

115 POINTING

- Flush finish throughout. Whilst fine joints in ashlar work may be filled in a single application, the filling of deeper cavities should be carried out in several stages:
  - Carefully smear a small quantity of mortar on the back and sides of the lacuna.
  - Add more mortar and bed in gallet(s) as necessary.
  - Fill joint flush, erring on the slightly proud side.
  - Keep the work dampened and well sheltered. Rain and water from operations being carried out in other work areas must not be allowed to run down any masonry faces immediately after they have been pointed.

116 PRESSING IN

- Compaction or 'pressing in' of the joint is vital in order to counter the effects of shrinkage and cracking as the mortar carbonates. The rate of cracking should be assessed and adequate time allowed for pressing in as and when cracks start to appear.
- Some mortars may require pressing operations to be carried out over a period of a day or more before the work becomes suitably stable. Water dampening can be used to slow the rate of cracking but extreme care should be exercised not to flood the work area. The final pressing involves neatening up the joint edges and levelling as necessary.
- For maximum sensitivity towards the surrounding historic surfaces, a small hand-size block of foam (e.g. high-density, pink under-floor foam is an ideal tool) should be used to produce the perfect texture.

117 PARING BACK

- When the work has dried out to a 'leather hard' state, carefully pare back the mortar surface with a sharp trowel edge or spatula to achieve the following:
  - Remove the white film of 'laitance' to create and open-pored surface to aid carbonation of the mortar.
  - Blend in the new work with adjacent existing/retained pointing.
  - Achieve the required flush finish.
- Note that a stiff bristle brush may be used as an alternative to a blade in 'opening up' the mortar surface.
- Visual assessment of the work area should be carried out after paring back to ensure broad consistency in texture and appearance. Note that some variation in texture will be necessary to make it relevant to the specific stone type(s) and finishes of each work area, e.g. mortar joints to course 'weather stone' should be textured differently to those on fine grained ashlar.

118 DRY BRUSHING

- Allow mortar surface to progress beyond 'leather hard' state and set firm; typically at least 24 hours after the mortar application.
- Brush off all loose material on masonry and joints using a soft bristle brush to further refine the texture of the pared back mortar.

119 SPONGING OFF

- It is important when patch-pointing an isolated area, filling smaller lacunae or working a single joint to avoid isolated 'white' areas showing up against an otherwise untouched surface.
- Ensure mortar surface is firm from previous operations.
- Fill bucket with clean water, soak flat clean sponge and squeeze out water.
- Pass the slightly damp sponge flat across the work using a horizontal 'swipe'/ 'planing' action.
- Use each face of the sponge once only and then rinse in clean water to avoid re-depositing lime residue on the work. Regularly replenishing the water supply, rinsing of the sponge and repeated 'planings' will help further refine and mellow a brushed surface.
- Fine joints in ashlar work are best pressed in as and when shrinkage dictates, then finished with a well-squeezed out clean, damp sponge using the planing action described above.
- Cleanliness and a clean supply of water are essential throughout the sponging off operations.

120 INCLEMENT WEATHER

- Do not use frozen materials and do not lay on frozen surfaces.
- Do not lay stone, attempt any mortar pointing and/or repairs or apply sheltercoat when air temperature is at or below 5°C unless mortar has a minimum temperature of 5°C when laid and walling is thermally protected.

130 PROTECTION

- Arrange the work so that there is sufficient time at the end of each day to consolidate, re-dampen and cover up work areas as necessary.
- Check condition of previously worked areas the following morning.
- Work should be planned and carried out such that it will not suffer over a weekend, unless adequate labour can be provided to tend it as necessary.
- Prevent damage to stonework, particularly arrises and projecting features. Protect with wooden slats, boards, etc., securely fixed. Remove at Practical Completion.
- Ensure work is shielded from strong sunlight, drying winds, driving rain and frost. Scaffolding should be erected such that vertical sheeting and damp hessian can be left in-situ to create a suitable environment for controlled carbonation of mortar repairs and sheltercoating.
- Prevent staining and other disfigurement of stonework during the works. Ensure that scaffolding rainwater detailing is adequate to keep run-off well away from work areas.
- Take care not to let damp hessian or plastic sheeting be blown against work areas. Keep covers taut and approximately 150 mm away from vertical plane of the stonework.
- Allow for some ventilation behind the protection layers, especially at ground level. This is necessary because saturated work cannot carbonate and is vulnerable to freezing at low temperatures.

L - GLAZING WORKS – see artist's documents for details on design of new window

PRELIMINARY INFORMATION/ REQUIREMENTS

100 **RECORD PHOTOGRAPHS:** These are to be deposited in the Abbey archive on completion.

200 STAINED GLASS/LEADED LIGHT GLAZING

210 **PROTECTION:** Protect furniture and furnishings in the Abbey to prevent damage during the time that access is required to the interior of the windows and during the removal of the glazing.

220 **RECORDING:** The existing glazing to be photographed before removal.

230 **REMOVAL:** Before attempting removal, the glass should be examined and any loose pieces secured by masking tape or tape and water soluble glue. Carefully cut out all pointing so as not to damage the surrounding masonry. Cut all wire ties and remove the glazing panels. The panels to be taken out from the head downwards and to be carefully lowered to ground level for storage.

240 **STORAGE AND TRANSPORTATION:** After removal the glazing panels must be stored in a vertical position and crated to safety. Transportation should be in purpose-made crates with packing to ensure they are held firm.

250 **TEMPORARY WEATHERING/SECURITY:**

- Carefully clean out the glazing rebates or grooves.
- In all windows supply and fix 3mm twin walled Correx or similar approved sheet as temporary protection and as temporary weathering.

270 **LEADING**: Cames: to be of refined lead with minimal or no antimonal or nickel content obtainable from an approved source and milled to the required profile matching the existing, and of sufficient heart width to accommodate the glass and allow for adequate cementing. No cames to be used that have a heavily oxidised surface.

280 **SOLDERING**: To be carried out in 60/40 tin/lead solder using hard tallow as a flux. After soldering all surplus tallow to be cleaned off. Leading to be carried out in accordance with rubbings to ensure correct size of panels. Border leads to match existing profile. Panel jointing leads to be wide heart to ensure correct overlap and weathering where this is applicable.

290 **CEMENTING:** Traditional glazing compound to be applied to both faces of the panels and well rubbed in to ensure a complete seal. Panels to be left for four days before final cleaning off. After final cleaning the leads to be rubbed down and polished with graphite powder.

300 **TIES:** 16 gauge copper wire ties to be cut, tinned and soldered on to the panels at the points as marked on the rubbings. Sufficient wire to be fixed to ensure that each tie encompasses the saddle bar plus at least four full twists.

310 **FERRAMENTA:** Existing ferramenta are ferrous and are to be replaced with grade 304 stainless steel bars or phosphor bronze bars of suitable section to work with the design of the new window. Samples to be approved by the CA. Bars to be secured into the existing rebates using lead wedges and covered using a weak lime-based mortar. Stainless steel bars to be painted using oil-based primers, undercoats and top coats, colour black, eggshell finish. Bronze bars may be left unpainted.

320 **FIXING OF GLAZING:** Tie the panels to the ferramenta firmly but gently, to ensure leads are not stressed.

350 **CLEARING SITE:** All rubbish caused as a result of the work shall be removed from the site and the interior cleaned after the removal of any protection.

T TEMPORARY WORKS:

10 Note:
These notes are supplementary to the conditions contained in the preliminaries.

20 Design of temporary works:
The contractor will be responsible for the design, arrangement and sequencing of the temporary works necessary to carry out the works specified, although the sequence is to be agreed with the Abbey Authorities and the Abbey Architect pre-contract. The access scaffolding is to be constructed to give adequate safe access to the work areas.

30 Floor space requirements and controlled access:
Contractors must provide proposals with tender. The working areas must be made secure to avoid unauthorised access into the working area for the safety of those using a visiting the building.

40 Protection of internal fittings:
Protect furniture and furnishings in the Abbey to prevent damage during the time that access is required to the interior of the windows and during the removal of the glazing. Agree extent with Abbey and CA before commencement. Dust protection installed to the scaffolding will provide the first (and best) line of defence against dust ingress.

50 Access points:
The intended positions of ladder access towers are to be indicated on the proposed scaffolding arrangement, and will be subject to approval by the Abbey Authorities and the Abbey Architect.

60 Water for the works:
To be confirmed.

70 Electrical power and lighting:
The contractor is to arrange for the adequate supply of electricity to the work area, with respect to both power for site equipment, and also for temporary lighting. Specific requirements for safety lighting for access routes must be addressed.

80 Fire precautions:
See preliminaries section A34.

90 Bearing points for scaffolding:
The contractor is to confirm that the points of loading for the standing scaffold will be adequately supported by the structure of the Abbey church building. Note that no temporary building-in of scaffolding will be permitted without the express authorisation of the Abbey Architect, and only then in specific locations to be agreed on site.

Z21 MORTARS

To be read with preliminaries, general conditions and drawings.

10 MORTAR MIX FOR REPAIR WORKS AND RE-POINTING

- Ratio of 1 part lime to 3 parts aggregate.
- English lime putty and natural hydraulic lime (NHL) from approved sources, see clause 30 and clause 40 below.
- Sands: Suitably graded and washed local Ashton Keynes 'sharp' sand (actually 'ovoid' or rounded/sub-rounded according to English Heritage nomenclature) may be substituted subject to CA approval.
- A sample section of re-pointing will be carried out by the contractor under guidance from the CA before mix is approved for the remainder of the repair works. This operation will allow the exact aggregate grading and proportions to be adjusted and refined in order to achieve the best performing mix for the works.

20 APPLICATION OF MORTAR FOR MORTAR REPAIRS AND BUILD-UPS

- Cut around edge of area to be repaired with a sharp chisel to provide a neat, strong edge or rebate to work to. Always follow the irregular outline of each area of decay so as to produce a naturally unobtrusive effect, cf. a straight-edged repair outline following a square or rectangular outline which will appear dominant.
- Exercise extreme care during these operations in order to strike an appropriate balance between:
  - Executing a thorough workmanlike task of cutting into the stone to create effective rebated perimeters to lacuna.
  - Conscientious conservation which involves the retention of maximum historic fabric (which in itself precludes cutting out more stone than is absolutely necessary). A sensitive 'stone-by-stone' approach is vital. Repairs in particularly sensitive areas of architectural detailing will be decided on site and subject to CA approval.
- Lightly 'peck' area within this margin with sharp chisel to give a good key and to remove any loose, friable material.
- Dry brush the surface and remove all debris from stone and scaffold. Flush loose dust from surface and wet stone several times with limewater.
- Re-mix matured mortar to plastic state and add pozzolanic additive if required.
- Prepare slurry of diluted 'surfacing' mortar (refer to clause 16 for mix) to be used as a 'tack coat'.
- Paint 'tack coat' onto area to be repaired and allow some slurry moisture to be absorbed by stone.
- Take care to remove any slurry outside repair area to avoid 'halo' marks on surrounding stone.
- Apply mortar firmly by spatula, small-tool and/or rounded pointing trowel to a maximum coat thickness of 12-15 mm. Take care to pack mortar tightly into all cavities before laying in the bulk of each repair.
- Ensure an ample supply of clean, suitably shaped and dampened tile fragments for quick selection of appropriate shape(s) for each repair.
- Non-ferrous armatures may be required, e.g. ceramic armature types. They are often more useful broken up into short 'stubs'. Set them horizontally into dampened holes at an approximate depth of 10 mm using a dab of the 'buttercoat'. The location holes should be of a slightly larger diameter than the armature so that they grip.

- Compress mortar after it has stiffened slightly; typically 5 to 15 minutes after application. In general, press in the work as and when shrinkage cracks appear.
- A second coat can be applied when the first is leather hard; typically 12 to 24 hours after first application. The surface of the first coat should be keyed. Build up and compress further layers as required.
- Surface can be textured by scraping back or beating with a bristle brush when leather hard.
- Protect mortar repair after initial compression using damp cotton hessian/cloth.

25 SAND FOR MORTAR

- To BS 1200 unless specified otherwise.
- Sand for facework mortar to be from one source, different loads to be mixed if necessary to ensure consistency of colour and texture.

30 LIME PUTTY

- Use mature lime putty which has a minimum age of 3 years (essential). CC and CA reserve the right to verify source and age of lime putty used for all repairs.
- Lime putty is to be have been made by slaking freshly burnt lime, with enough water to obtain a soft mass of putty. The slaking lime must be hoed and raked and stirred until the visible slaking reaction has ceased. Sieve to remove un-burnt lumps and coagulations using a 2 mm screen.
- Lime putty, with a shallow covering of water, to have been stored for a minimum period of three years.
  There is no upper limit to the storage period, providing the lime is properly 'knocked up' prior to use.
- Obtain lime form approved suppliers, in plastic bins, dated with date of slaking.
- Approved suppliers of lime:
  - Heritage Lime
    Henley Farm, Miserden, Stroud, Gloucestershire GL6 7HZ
    Tel: 01285 821751
  - The Lime Centre
    Long Barn, Morestead, Winchester, Hampshire SO21 1LZ
    tel: 01962 713636
  - Limebase Products Ltd.
    Walronds Park, Isle Brewers, Taunton, Somerset TA3 6QP
    tel: 01460 281921
  - Rose of Jericho Ltd.
    Westhill Barn, Evershot, Dorchester DT2 OLD
    tel: 01935 83676 fax: 01935 83676
  - The Traditional Lime Company
    Church Farm, Leckhampton, Cheltenham, Gloucestershire GL53 0QJ
    tel: 01242 525444
  - Ty-Mawr Lime Ltd.
    Unit 12, Brecon Enterprise Park, Brecon, Powys LD3 8BT
    tel: 01874 611350
  - Mike Wye & Associates Ltd.
    Buckland Filleigh Sawmills, Buckland Filleigh, Beaworthy, Devon EX21 5RN
    tel: 01409 281644

40 HYDRAULIC LIME

- Use Blue Lias hydraulic lime, from approved sources only.
- Approved suppliers of hydraulic lime: as clause 30 above.

50 ADMIXTURES: Do not use any admixtures.

60 MAKING MORTAR

- Measure materials accurately by volume using clean gauge boxes. Proportions of mixes are for dry sand; allow for bulking if sand is damp.
- By adding the sand to the lime putty, mix ingredients thoroughly to a consistency suitable for the work and free from lumps.
- Ensure 'coarse stuff' is well beaten, rammed and chopped to ensure the best mix.
- Do not add excess water to the mix. It is not required. By following the above instructions, excess water is not needed.
- Do not use an ordinary cement mixer for mixing. A traditional 'larry' or a paddle mixer may be used.
- Make up a large enough batch of mortar to complete work on each elevation at the commencement of works. This ensures consistency of mix, and also a mature coarse stuff.
- Store coarse stuff in air-tight containers, to allow for later knocking up when required.
  There is no upper limit for the storage period of coarse stuff if stored properly.
- Mortar is to be tipped out of the containers and the whole batch knocked up. Again, no excess water is required at this point.
- Keep plant and banker boards clean at all times.

70 ALL LIME-BASED MORTARS

- Are to be thoroughly protected from running or surface water for a minimum period of 36 hours after incorporation into the works.
- Unprotected work may require removal and re-instatement at discretion of the CA.

80 LIME-BASED MORTARS

- Must not be used in adverse weather conditions, i.e. when outside air temperature is less than 1°C.
- Work in cold weather shall be protected to ensure a minimum temperature of 5°C is maintained in the work when laid, and must be maintained for at least seven days after use.
- In any case, work with mortar shall cease at 2°C on a falling temperature and only re-commence on a rising temperature on 1°C, even when protected.
- No mortar plasticisers of anti-freezes may be used at any time.
- During any break in use of mortar, all work shall be protected against rain, frost and snow with waterproof coverings.
- Work in hot weather shall be permitted even when the air temperature adjacent to the work exceeds 25°C, so long as ambient humidity is kept sufficiently high. Avoid all draughts and hang wetted hessian on the outer scaffold. Protect the work at night with additional wetted hessian hanging slightly away from the work, this in turn to be covered by plastic sheeting.
- Wet hessian must not be allowed to blow against any of the work areas in order to avoid lime blooming.

- During any period where the temperatures exceed 25°C, all work less than three days old is to be kept moist and prevented from rapid drying out by using hessian and plastic sheeting as stated above.

90 CEMENT

- Do not use cement of any type for lime-based mortar repairs.