**GENERAL REQUIREMENTS**

100 READ with Preliminaries, Schedule of Work, Drawings and Specialists Report / Specification (as appropriate) which have been prepared specifically for this Contract.

105 GENERALLY: This Specification sets out the trade materials and workmanship requirements for the repair work in the Contract, which must be read with the General Conditions and other Contract Documents, particularly those listed above. Where the Contractor is required by this Specification to provide details of proposed sub-contractors or suppliers, these must be supplied with his tender. Where method statements, drawings, samples and other proposals are required, these must be supplied at least three weeks in advance of the work commencing. These dates should be indicated on the Contractor's programme.

**MATERIALS: CONSTITUENTS**

110 PURE LIME PUTTY: Lime putty, ready prepared to BS EN 459-1 from CL.90 high calcium, non-hydraulic quick lime ('air lime'); burnt in a traditional coal-fired kiln; fully slaked, run to putty and matured for not less than 90 days; density when matured to be 1.3- 1.4 kg/l. To be delivered and stored in sealed containers in an excess of water as long as possible to exclude air and be air-tight. From time to time draw off 'water' from surface and retain, stored separately, for use elsewhere. Type to be one of the following as instructed or otherwise agreed with the CA before ordering:

a. Superfine Buxton Lime Putty available from: Rose of Jericho Ltd (Tel. 01935 836 76; www.rose-of-jericho.demon.co.uk ) or equal and approved.
b. Mortar grade Cheddar Lime Putty available from: Rose of Jericho Ltd (Tel. 01935 836 76; www.rose-of-jericho.demon.co.uk ) or equal and approved.
c. Singleton Birch Lincolnshire Chalk Lime Putty (Singleton Birch Ltd, Barnetby, tel. 01652 686000; www.singletonbirch.co.uk ) available from: Rose of Jericho Ltd (Tel. 01935 836 76; www.rose-of-jericho.demon.co.uk ) or equal and approved.
d. Limetec High Calcium Non-hydraulic lime available from The Old House Store (tel/ 0118 969 7711; www.oldhousestore.co.uk ) or equal and approved.
e. Calch Ty-mawr Fat Lime Putty available from the Welsh Centre for Traditional and Ecological Building (tel. 01874 658249; www.lime.org.uk )

120 HYDRAULIC LIME: Hydrated hydraulic quick lime, properly slaked, sieved and free of lumps to BS EN 459-1. Inspect on delivery and before use; discard all damaged bags. Moderately and feebly hydraulic lime, as specified or instructed, Hydraulic lime only to be used in exposed positions or for out of season working where specifically instructed.
Type to be one of the following as instructed or otherwise agreed with the CA before ordering:

a. Castle French Hydraulic lime NHL3.5, Castle Cement Limited Birmingham (tel. 0121 6064000; www.castlecement.co.uk )) available from The Old House Store (tel/ 0118 969 7711; www.oldhousestore.co.uk ) or equal and approved.
b. St Astier Hydraulic Lime (NHL 2 or NHL3.5) available from The Old House Store (tel/ 0118 969 7711; www.oldhousestore.co.uk ) or The Lime Centre (tel. 01962 713636; www.thelimecentre.co.uk; www.stastier.co.uk ) or equal and approved.
c. Singleton Birch Hydraulic Lincolnshire Lime from silaceous chalk; available from (Singleton Birch Ltd, Barnetby, (tel. 01652 686000; www.naturallyhydrauliclime.co.uk) available from: Rose of Jericho Ltd (Tel. 01935 836 76; www.rose-of-jericho.demon.co.uk) or equal and approved.

140 READY-MIXED LIME AND SAND: Ready-mixed to **BS 4721**, covered and kept for at least 1 hour before use. Coloured mortar, where required, to be made using a proprietary coloured ready-mixed lime:sand, colour

to approval where not specified; available from: Rose of Jericho Ltd (Tel. 01935 836 76; www.rose-of-jericho.demon.co.uk ) or equal and approved.

To be stored in sealed airtight containers, kept away from extremes of temperature.

150 WHITE CEMENT: White Portland Cement to **BS 12: 1978**, to be used, where directed, in accordance with **BS 12** or **BS 4027 (1972)** and **BS 4248**, as appropriate.

160 ORDINARY PORTLAND CEMENT: OPC to BS 12:1998, to be used, where directed, in accordance with **BS 12** or **BS 4027 (1972)** and **BS 4248**, as appropriate.

170 SAND: To **BS 1199** and **BS 1200:1976**, unless specified otherwise. To be clean, well graded, sharp, pit or freshwater sand, free from loam, salts and other impurities.
Sands used throughout works are to be from the same source as those used in approved samples.
Different loads to be mixed if necessary to ensure consistency of colour and texture.
To be stored on free-draining base away from trees and covered with tarpaulins.

175 SANDS: Provide samples of the following sands for preparation of sample plaster mixes and panels; select and sieve sands as required to match the existing mortar in colour and texture in each location; compare with analysis of the existing mortar samples when binders dissolved; receive instruction from the CA and obtain supplies of sand for mortar/s for the works to match approved sample.

List of Sands for samples:

a. (Insert sand type, colour and quarry name from EH Guide)

180 GRIT: Clean, well-washed and graded sharp grit to produce a properly graded aggregate mix with sharp sand (2.36 - 1.18 mm).

185 AGGREGATE: Concreting aggregate from same quarries as sand, sived to 6mm down or required size; clean, well graded, sharp, pit or freshwater quartz sand, free from loam, salts and other impurities.

190 STONE DUST: Portland Stone dust or a stone to match the surrounding masonry, ground below 850 microns, clean well washed.

195 STONE PARTICLES: Crushed Portland Stone or a stone to match the surrounding masonry, crushed in to particles 6mm down, clean well washed.

200 CLAY, CHALK OR OTHER AGGREGATES: As specified in Schedule of Work or analysis report to match existing mix.

210 BRICK DUST: Finely ground dust from red rubber bricks specifically prepared for purpose; supplied by Bulmer Brick and Tile Ltd of Suffolk or equal and approved.

220 WATER: Clean, pure and preferably obtained from mains supply. Tested to **BS 3148** if required. To be conveyed and stored in clean containers. Containers should not be used for any other purpose.

230 ADDITIVES: No plasticisers, workability agents, anti-freeze compounds, air entrainers or other additives shall be used.

**MATERIALS: PROPORTIONS OF MIXES**

240 LIME AND CEMENT MORTARS GENERALLY: All constituent materials and mix proportions are to be agreed with the CA on site after carrying-out samples for approval. A degree of experimentation will be necessary on site in order to achieve the most suitable and workable mix or mixes. The Contractor must allow in the programme for these trials to be carried-out in conjunction with the CA. The assumption is that mortars will be based upon lime putty or hydraulic lime, rather than cement binders and the Contractor must take account if this in the programming of the work and the need for protection.

250 SAMPLES OF EXISTING MORTARS:
Either:
i. Sample/s of existing mortars have been taken before tender and a copy of the report is attached. The mortar mixes quoted in the Schedule of Work or on the Drawings are therefore intended to imitate this mix or mixes.

or:
ii. The Contractor must allow for taking samples of existing mortars in each different condition where re-pointing has to be carried-out. Dispatch samples for testing to Rose of Jericho or another approved laboratory and forward the results to the CA for instructions.

260 GUIDANCE MIXES FOR STONEWORK: The mixes given below are for guidance only, exact mix proportions will be determined on site after approval of samples etc.

S1 FOR LAYING & POINTING LIMESTONE: 1:2: $^{1}/_{2}$, Sived lime putty: Fine sharp sand (sived down to suit joint width and selected for colour) : stone dust.

S2 FOR BEDDING CRAMPS AND DOWELS: 1:2$^{1}/_{2}$, NHL 3.5 hydraulic lime: Fine sharp sand.

S3 FOR LAYING FLAGS EXTERNALLY: 1:4, NHL 3.5 Hydraulic Lime: Sharp course sand dry mix.

S4 FOR POINTING FLAGS EXTERNALLY: 1:2: $^{1}/_{2}$, Hydraulic lime: sharp sand (selected for colour): stone particles.

265 GUIDANCE MIXES FOR BRICKWORK:

The mixes given below are for guidance only, exact mix proportions will be determined on site after approval of samples etc.

B1 FOR LAYING AND POINTING FACING BRICKS: 1:3, Lime Putty: Sharp sand, (sived down to suit joint width and selected for colour, texture and mixed with brick dust to agreed proportions).

B2 FOR LAYING AND POINTING BRICKWORK OUT OF SEASON:
1:2.5 NHL 3.5 hydraulic lime: 6mm down sharp sand (selected for colour and texture).

B3 FOR BRICKWORK BELOW DPC: 1:2:9, OPC: Lime putty; sharp sand (6mm down and selected for colour and texture).

B4 FOR ENGINEERING BRICKS TO MANHOLES: 1:2:9, OPC: hydrated non-hydraulic lime; sharp quartz sand.

270 SAMPLES OF POINTING MIXES: Samples are to be approved before ordering bulk materials, in the first instance, on the basis of broken samples. The contractor will be expected to produce variants on the basic

mixes given above, slightly altering proportions of constituents to achieve a suitable match with the existing.

Allow for up to 10no. variants on each mix type quoted above or in the Schedule of Work. Dry broken samples are to be stored on site for reference, clearly marked and protected until Practical Completion. Ensure executed work matches approved samples by careful control of on-site mixing or by ordering ready-mixed mortar.

**WORKMANSHIP:**

280 PREPARING MORTARS:

Keep plant and banker boards clean at all times.

Measure materials accurately by volume using clean gauge boxes made to sizes to suit volumes required. Overfill gauge boxes and strike off excess material with straight edge. Proportions of mixes are for dry sand; allow for bulking if sand is damp. Where a range is given (e.g.1:1:5-6), use higher value for well graded sand (Grade S sands) and lower value for coarse or uniformly fine sand (Grade G sands).

Mix materials thoroughly so that all individual constituents are incorporated evenly to a consistency suitable for the work and free from lumps.

290 LIME: Coarse stuff to be prepared as early as possible and storage time to be as long as possible and no less than two weeks. To be stored in sealed airtight containers and kept away from extremes of temperature. Ensure all pure lime putty is well sieved and well beaten or rammed into the mortar mix to ensure thorough mixing. No pure lime pieces will be acceptable in the mix. At each stage the constituents are to be consistently mixed, well rammed and beaten and should contain the minimum of water

300 HAND MIXING of mortar will be permitted only with the approval of the CA and where small quantities are required. Where approved, carry out on a clean hard platform. Thoroughly mix all other materials prior to the addition of water which is to be sprayed from a watering can fitted with a rose. Add only sufficient water to make the mix workable.

310 MECHANICAL MIXING: Mix mortar in a mechanical mixer of a size suitable to mix whole multiples of 50kg bags in one batch. Mix continuously, for a minimum of five minutes, after the addition of water until a homogeneous mix is obtained. No water is to be added until all other materials have been thoroughly mixed in the mixer. Add only sufficient water to make the mix workable.

320 HYDRAULIC ADDITIVES: Use mortar within about two hours of addition of hydraulic material (cement, HTI, brick dust or other pozzolanic material) when mixing at normal temperatures. Do not use after the initial set has taken place and do not retemper.

330 PLASTICISER: Plasticisers are <u>not</u> to be used in mixes without the explicit written instructions of the CA.

340 PREMIXED MORTARS: Where specified obtain pre-mixed mortars from supplier and store in air tight sealed containers until use. Empty required quantities onto clean board and work up by hand before use; allow excess liquid to be absorbed by the board before use.

**WORKMANSHIP: POINTING AND REPOINTING**

350 GENERALLY: The scope of pointing and repointing work to be described in the Schedule of Work and on the Drawings. Confirm the scope of work with the CA before proceeding. Carry-out pointing to

new work and re-pointing of surrounding masonry in one operation to give consistent appearance across existing and repairs.

360 WORKING SEASON: Do not carry-out work with ungauged lime mortars between the end of September and the beginning of March. Do not carry-out external work when the air temperature is below +3$^0$C on a falling thermometer or +1$^0$C on a rising thermometer or while materials or background are frozen. Monitor internal temperature during cold weather.

370 SAMPLES PANELS: Prepare sample panels in agreed location(s) 900 x 900mm approximately, for each condition and each type of joint/colour required. Submit panel(s) first raked out and prepared for repointing. When this stage is approved point panel(s) using the approval mortar (see Clauses 260 & 265) and obtain further approval before proceeding. Retain and protect sample(s) for reference until Practical Completion and ensure executed work matches the panel(s). Any work not complying with the standard established in the sample work is to be removed and redone at the Contractor's expense. Note that it may be necessary for the CA to obtain approval from the Local Planning Authority, English Heritage or funding body for the sample panel(s) and the Contractor should prepare them well in advance of the work commencing. Indicate on the Contract Programme.

380 BRICKWORK: Carefully brush down face of brickwork removing surface deposits, algae and friable material. Inspect joints closely to establish soft or failed mortar over area to be repointed. Only repoint where necessary. Check existing pointing for hairline cracking, mortar breakdown or hollow areas and report to CA.

390 CUT OUT existing joints in brickwork and stonework for repointing to depth at least twice their width and leave cavity clean with a square face to the remaining old mortar, and no mortar remaining to the sides of the stone/brick. Take great care not to damage arises of adjacent bricks/stones when cutting out or raking out. Use only hand tools approved by the CA before any work is done such as fine chisels, fine toothed saw blades, hooked knives or small drills. Joints to be cut out only by skilled craftsmen under direction of competent mason, experienced in type of work to be tackled.

400 DEEP REPOINT: Where specified existing joints to be raked out to a minimum depth of 38mm for repointing, work sequenced as required to maintain integrity of structure.

410 HARD POINTING: **Removal of cement pointing:** Rake out loose cement from joints using a hooked knife blade or pointing spatula. Where cement pointing is solid, manually drill 2mm holes along centre of joint at 50mm centres and carefully cut out remaining cement using a 6mm chisel and mallet.
Where adjacent stones or bricks have weathered back, leaving projecting cement mortar, gently pick off with a 6mm chisel and mallet. Work methodically along the line and break each piece into the cleared joint, ensuring arrises are not damaged. Rake out and repoint as Clauses 390 and 460.
Disc cutters will not be permitted.

420 REMOVAL OF IVY: Cut out section of main stem at convenient point. Do not pull complete plant from wall but carefully ease and tease out roots at each joint, wedging with temporary pre-damped wooden wedges as required. Peel bark back 50mm at stump and coat exposed surface with paste made from ammonium sulphamate crystals. Leave stump to wither. Wear protective clothing and follow manufacturers' instructions when using plant killer. Organise with the CA a demonstration of the method of removing mortar types and ivy and obtain the approval from the CA before proceeding.

430 REPLACE to a minimum depth of 100mm all stones, and to full brick depth any bricks damaged during cutting out, at Contractor's expense and as directed by the CA.

440 CLEAN JOINTS: Carefully clean out joints with a bristle brush and air hose to remove all loose material. Wash out cleared cavities with fine gentle spray of water working downwards from top of wall.

450 LOOSE AND REPLACEMENT STONES: Carefully remove loose bricks/stones. Clean out cavity and wash with water to remove dust, pre-wet adjacent material and re-set removed or replacement stones in a full bed of mortar. Set stones to follow adjacent course lines/to a true and level line and as directed by the CA.

460 REPOINTING GENERALLY: Begin from top of wall. Do not begin repointing until all masonry repairs, all cutting and raking-out and all cleaning-out has been completed and approved by the CA.
Immediately before repointing flush out joints with water to remove all dust and to control suction. Wet surface until it remains wet. In dry conditions keep it damp as work proceeds to prevent dewatering of the mortar. While damp fill joint with specified mortar. Thoroughly compact mortar to fill all voids and to ensure mortar adheres well to each side of joint. Iron mortar in with pointing tool that neatly fits the full joint width (not trowel), keeping finished mortar face back from damaged arises and to width of original joint. Remove excess mortar immediately from adjacent faces and protect the work from rapid drying out and rain.
Pointing profile is to be flush with the face of the wall but slightly recessed to reveal arises.
Use waxed twine as a backing gasket where joints prove hollow beyond the specified repointing depth. Narrow joints may not be widened to make repointing easier. Voids in the repointing will not be acceptable.

470 REPOINTING FINE JOINTS: For filling fine joints less than 3mm wide use one of the following methods as appropriate and agreed with the Archtiect.

**'Adhesive tape method':** Apply 50mm wide heavy-duty tape over the joint. Slit tape with a sharp knife along centre of joint. Push mortar with pointing iron through slit in tape and compact. Peel away adhesive tape.

**[OR]**

**'Putty sandwich method'**: Spread finely screened lime putty in a strip on a sheet of thin polyester film. Lay second polyester sheet on top to form sandwich.
Insert sandwich into joint. Hold mortar in position with pointing iron whilst withdrawing top sheet of film, and then bottom sheet. Compress newly placed mortar with pointing iron. Trim off surplus mortar with the end of a sharp, bent knife blade.

**[OR]**

**'Mortar Injection method'**: Seal outer face of crack with 3-5mm depth of mortar squeezed in from the face.
Using a 10cc hypodermic syringe, inject a grout consisting of 4 parts hydraulic lime, 1 part finely powdered brick dust and twelve parts gauging liquid i.e. water with 0.5 parts of acrylic emulsion added. Push the hypodermic needle through the thin mortar and inject slowly.
Open holes at approximately 150mm centres to check the grout flow and allow air to escape, closing these with a small squeeze of lime putty. Clean off residual lime from the surface of the stone on the following day with a hand spray and a small bristle brush.

**[OR]**

**'Pointing gun with modified nozzle method':** Adapt nozzle of a proprietary mortar gun by sweating on a piece of sheet copper 2mm across, 10mm wide and 25mm long.
Fill gun with mortar of 2 parts lime putty and 1 part silver sand.
Insert nozzle into joint and squeeze mortar into joint filling the back of the joint in first. Tamp the mortar with thick wire when the joint is half full and upon completion.

480 REPOINTING STANDARD AND WIDE JOINTS more than 3m wide: Cut out and prepare as specified above and instructed on site by the CA. Thoroughly compact the mortar into the joint to fill all voids and ensure it adheres to each side of the joint. Iron- in the mortar using appropriate pointing tools of same width as joint. The work is to be carried-out by skilled craftsmen who have previously prepared the sample panels. Ensure a range of suitable pointing irons are available for the work. Pointing must not be undertaken using brick-laying trowels.

490 ASHLAR STONEWORK POINTING: Iron in mortar with pointing tool (not trowel) of width to suit joint width. Press mortar into joint and strike off flush, keeping mortar off face of stonework.

500 REPOINTING SKY FACING JOINTS**:** Rake out all deteriorated joints and open joints to be pointed, using fine-toothed saw blade or hooked knife blade, for the full height of the joint and to a minimum depth of 50mm.
All prepared joints, by whatever method, must leave a clean square face at the back of the joint to provide optimum contact with the mortar. All joints on completion of raking or cutting out will be washed and brushed clean of all debris and loose material before progressively wetting the stonework as pointing proceeds.
Gauge mortar with 10 -15% HTI or 1 part white cement to 10 parts coarse stuff as instructed by the CA.
The mortar will be placed and well tamped into the full depth of the joint, minimum 50mm, using a pointing trowel or pointing iron which fits into the width of the joint for the full joint width. Excess mortar will be immediately removed from adjacent surfaces and protected from rapid drying out or rain.
Pointing is to be flush, but slightly recessed to reveal arises.

510 PAVEMENTS: Carefully cut out defective pointing to depth 25mm leaving square base. Brush, then wash out loose material and leave clean. Press dry mortar mix into joints taking care not to mark stone face. When the full depth of mortar is consolidated brush away excess and spray overall with fine water spray.

520 SETTING: Keep pointing damp until full set has occurred. Take particular care to reduce suction of existing fabric with small areas, and to maintain dampness until full set has occurred. IN DRY WEATHER keep area of work damp for a minimum of four hours before pointing and three days after completion. Protect as set out below.

530 AFTER INITIAL SET: Lightly spray surface with water spray and stipple with stiff bristle brush or dab with coarse sacking or brush with small bronze brush to give roughened texture to match existing work and as approved sample panel. All workers are to use identical finishing tools to maintain a uniform appearance. Do not brush mortar onto surface of surrounding bricks/stones.

540 CLEANLINESS: Keep face of brick/stonework clean during pointing. Wash and brush down surface to remove light staining as soon as it occurs. WASH DOWN completed sections of wall from top to bottom after pointing has hardened using high pressure, minimum volume water spray.

**PROTECTION**

550 PROTECT: All pointing work from sun, wind, rain and frost, until full set is complete, using dampened hessian, polythene or foam rubber sheeting as appropriate. Monitor the condition of the pointing during the setting process and modify condition as required to prevent too speedy set of lime mortars. Ensure that the Contract Programme allows for sufficient setting time and the access scaffold remains in place until all pointing work has set and been inspected by the CA.

560 COVER: Arrises, moulding, carvings and other finished work with adequate protection until completion. Keep completed work clean and free from damages staining by other trades until completion.

570 CLEAN OFF: Rub down and leave stonework clean, brush down brickwork, all to approval of the CA as scaffolding is taken down.

580 HEALTH & SAFETY: Comply with all current health and safety regulations and restrictions and all requirements of the General Conditions.