

## APPENDIX D - NBS SPECIFICATION



**11 October 2017**

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**C**  
**Demolition/ Alteration/ Renovation**

**C41**  
**Repairing/ Renovating/ Conserving masonry**

## **C41 Repairing/ Renovating/ Conserving masonry**

To be read with Preliminaries/ General conditions

### **GENERALLY/ PREPARATION**

#### **110 SCOPE OF WORK**

Schedule: Ellis and Moore Specification, drawings and Photographs.

Records of masonry to be repaired: Before starting work, use measurements and photographs as appropriate to record bonding patterns, joint widths, special features, etc. 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**

Purpose: To confirm type and extent of repair/ renovation/ conservation work shown on drawings and described in survey reports and schedules of work.

Parties involved:

- Contract administrator;
- Architects;
- Contractor's representative; and
- Structural engineer.

Timing: Prior to start of brickwork repairs.

Instructions issued during inspection: Confirmed by Architect in writing, with drawings and schedules as required, before commencing work.

#### **125 REMOVAL OF FITTINGS/ FIXTURES**

Items to be removed, and reinstated on completion of repair work: to be confirmed.

Identification: Attach labels or otherwise mark items using durable, non-permanent means, to identify location and describe re-fixing instructions, where applicable.

Treatment following removal: As schedule.

Storage: Protect against damage, and store until required.

Storage location: Submit proposals.

Reinstatement: Refit in original locations using original installation methods.

Items unsuitable or not required for reuse: to be confirmed.

Disposal: Submit proposals.

Masonry fabric and surfaces: Do not damage during removal and replacement of fittings/ fixtures.

#### **130 REMOVAL OF PLANT GROWTHS FROM MASONRY**

Plants, root systems and associated soil/ debris: Carefully remove from joints, voids and face work.

Removal of roots: Where growths cannot be removed completely without disturbing masonry seek instructions.

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**

General: Record work carried out to masonry clearly and accurately using written descriptions, sketches, drawings and photographs, as necessary.

Specific records: none.

Documentation: Submit on completion of the work.

Number of sets: 3.

## **WORKMANSHIP GENERALLY**

### **150 POWER TOOLS**

- Usage for removal of mortar: Permitted only with prior approval.

### **160 PROTECTION OF MASONRY UNITS AND MASONRY**

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.

Masonry: Prevent damage, particularly to arrises, projecting features and delicate, friable surfaces. Prevent mortar/ grout splashes and other staining and marking on facework. Protect using suitable nonstaining slats, boards, tarpaulins, etc. Remove protection on completion of the work.

### **165 STRUCTURAL STABILITY**

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**

Retained masonry in the vicinity of repair works: Disturb as little as possible.

Existing retained masonry: Do not cut or adjust to accommodate new or reused units.

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**

Skill and experience of site operatives: Appropriate for types of work on which they are employed.

Documentary evidence: Submit on request.

### **185 ADVERSE WEATHER**

General: Do not use frozen materials or lay masonry units on frozen surfaces.

Air temperature: Do not bed masonry units or repoint:

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.

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.

In nonhydraulic lime:sand mortars in cold weather, unless approval is given.

Temperature of the work: Maintain above freezing until mortar has fully set.

Rain, snow and dew: Protect masonry by covering during precipitation, and at all times when work is not proceeding.

Hot conditions and drying winds: Prevent masonry from drying out rapidly.

New mortar damaged by frost: Rake out and replace.

### **190 CONTROL SAMPLES**

General: Complete an area of each of the following types of work, and arrange for inspection before proceeding with the remainder. Cutting out and replacement of facing brick to areas of tooled Medieval brickwork/ features. Raking out and repointing. Tinting of previously cement based mortar. Location of sample panels to be agreed with the Contract Administrator.

## **MATERIALS/ PRODUCTION/ ACCESSORIES**

### **210 ADVANCE REGISTRATION**

Material registered in advance by the Employer: Obtain from the supplier named in Preliminaries section A56.

Ordering: Supersede the Employer's registration and take over responsibility by an order to the supplier covering price, supply and delivery to suit the progress of the work.

- 215 **MATERIAL SAMPLES**  
 Representative samples of designated materials: Submit before placing orders.  
 Designated materials: Sands for bedding and pointing, facing bricks  
 Retention of samples: Unless instructed otherwise, retain samples on site for reference.  
 Protect from damage and contamination.
- 220 **RECORDING PROFILES**  
 Profiles: Take measurements from existing masonry units, as instructed, to allow accurate matching of replacements.  
 Recording in situ: If there are no suitable joints to allow use of inserts, seek instructions.  
 Drawings and templates: Prepare as necessary. Templates must be clearly and indelibly marked to identify use and location.
- 230 **INSPECTION OF DRAWINGS, TEMPLATES, CASTS, ETC**  
 Timing: Before starting production of masonry units associated with the following items: to be confirmed.  
 Period of notice (minimum): 3 weeks.
- 260 **BRICKS**  
 Manufacturer: Contractor's choice.  
 Product reference: to be confirmed.  
 Size: to match existing bricks.  
 Special shapes: to match existing.  
 Recycled content: Submit proposals.
- 265 **SALVAGED AND SECOND HAND BRICKS**  
 Source: Existing cracked bricks removed, cleaned, bonded with approved epoxy resin adhesive and reused.  
 Condition: Free from matter such as mortar, plaster, paint, bituminous materials and organic growths. Sound, clean and reasonably free from cracks and chipped arrises.
- 280 **PROPRIETARY FIXINGS** submit proposals for approval  
 Manufacturer: contractor's choice.  
 Product reference: submit proposals for approval.  
 Material: Austenitic stainless steel.  
 Size: as approved.
- 285 **BED JOINT REINFORCEMENT TO MASONRY** crack repairs  
 Manufacturer: Contractor's choice.  
 Product reference: Helibar  
 Material: Austenitic stainless steel  
 Width: Approximately 40-50 mm less in width than wall or leaf.  
 Laying: On an even bed of mortar in a continuous strip with 225 mm laps at joints and full laps at angles. Keep back 20 mm from face of external work, 12 mm back from face of internal work and finish mortar joint to normal thickness.
- 285A **CRACKBOND TE**  
 Manufacturer: Helifix .  
 Web: [www.helifix.co.uk](http://www.helifix.co.uk).  
 Email: [sales@helifix.co.uk](mailto:sales@helifix.co.uk).  
 Product reference: CrackBond TE  
 Accessories: Standard mastic applicator.

## **DISMANTLING/ REBUILDING**

### **310 DISMANTLING MASONRY FOR REUSE**

Masonry units to be reused: Remove carefully and in one piece.

Treatment: Clean off old mortar, organic growths and dirt, and leave units in a suitable condition for rebuilding.

Identification: Mark each unit clearly and indelibly on a concealed face, indicating its original position in the construction. Transcribe markings to drawings/ photographs.

## **REPLACEMENTS AND INSERTIONS**

### **330 PREPARATION FOR REPLACEMENT MASONRY**

Defective material: Carefully remove to the extent agreed. Do not disturb, damage or mark adjacent retained masonry.

Existing metal fixings, frame members, etc: Report when exposed.

Redundant metal fixings: Remove.

Recesses: Remove projections and loose material; leave joint surfaces in a suitable condition to receive replacement units. Protect from adverse weather if units are not to be placed immediately.

### **365 REPLACEMENT OF BRICKS GENERALLY**

Bricks: Clay as clause 260.

Mortar: to match existing.

Mix: 1:1:6 cement: lime: sand.

Sand source/ type: Well graded crushed stone to approval.

Fixings: Not required.

Joints: To match existing.

Other requirements: None.

### **385 LAYING REPLACEMENT MASONRY UNITS**

Exposed faces of new material: Keep to agreed face lines.

Faces, angles and features: Align accurately. Set out carefully to ensure satisfactory junctions with existing masonry and maintain existing joint widths.

Joint surfaces: Dampen to control suction as necessary.

Laying units: On a full bed of mortar, all joints filled.

Exposed faces: Keep clear of mortar and grout.

### **390 GROUTING JOINTS**

Grout mix: Nonhydraulic lime with pozzolanic admixture; mix subject to site trials.

Joints that cannot be fully filled with bedding mortar: Grout thoroughly around replacement masonry units.

Grouting: Keep grout back from exposed face to allow for the depth of pointing, using an approved temporary sealing material. Prevent grout staining exposed face.

### **410 CORRODED METAL FIXINGS**

Removal: Cut out carefully, causing the least possible disturbance to surrounding masonry. Remove associated rust debris.

Replacement: Compatible fixings as clause submit proposals for approval.



## MORTAR REPAIRS

### 510 PREPARATION FOR MORTAR REPAIRS

Repair area: Scribe area of masonry to be removed using straight horizontal and vertical lines parallel to joints. Where repair area abuts joints, maintain existing joint widths and do not bridge joints.

Decayed masonry: Cut back carefully to a minimum depth of 20 mm to a sound background. Where the depth of removal exceeds 50 mm, seek instructions.

Precautions: Do not weaken masonry by removing excessive material. Do not damage adjacent masonry.

Top and vertical reveals of repair area: Undercut.

### 515 REINFORCEMENT FOR MORTAR REPAIRS

Material: Austenitic stainless steel, phosphor bronze or copper alloy wire, 4 mm diameter.

Armatures: Form to suit profiles of mortar repair and provide effective reinforcement.

Cover to reinforcement: Not less than 20 mm.

Installation: Drill holes into background to receive reinforcement, and bond firmly with a suitable epoxy resin.

### 520 MORTAR REPAIRS to be applied

Undercoats: As existing.

Mix: 1:1:6 cement: lime: sand.

Sand source/ type: Sharp well graded sand to approval.

Building up: In layers where necessary, each layer not exceeding 12 mm.

Finishing coat: To match approved samples.

- Mix: 1:3 nonhydraulic lime putty: sand and stone dust.
- Sand source/ type: Sharp well graded sand to approval.
- Finished thickness: 6 mm.
- Finish: Scraped back as clause 550 or floated as clause 555, to approval.

Reinforcement: Not required.

### 530 PROPRIETARY MORTAR REPAIRS to specified areas

Mortar:

- Manufacturer: submit proposals for approval.  
Product reference: None.
- Undercoats: Use when total thickness of mortar repair exceeds limit for finishing coat thickness recommended by mortar manufacturer. Build-up in layers as necessary, each layer not to exceed thickness recommended by manufacturer.
- Finishing coat: To match approved samples.  
Finished thickness: 6 mm.  
Reinforcement: Not required.

### 540 APPLYING MORTAR

Surfaces to receive mortar: Clean, and free from dust and debris. Dampen to control suction.

Applying coats: Build up in layers to specified thickness. Apply mortar firmly, ensuring good adhesion with no voids. Form a mechanical key to undercoats by combing or scratching to produce evenly spaced lines.

Allow each layer to achieve an initial set before applying subsequent coats. Prevent each layer from drying out rapidly by covering immediately with plastics sheeting and/ or dampening intermittently with clean water.

Finishing mortar coat: Form accurately to required planes/ profiles, and finish flush with adjacent masonry.

Protection: Protect completed repairs from adverse weather until mortar has set.

## CRACK REPAIRS/ TIES/ REINFORCEMENT

- 610 MORTAR REPAIR OF CRACKS 1:1:6 cement:lime:sand mortar  
Mortar: Specification  
- Mix: 1:1:3 cement:lime:sand,  
- Sand source/ type: Contractor's choice.  
Preparation: Clean out cracks to remove debris, dust and dirt. Dampen recesses, as necessary, to control suction.  
Applying mortar: Press well into cracks so that they are fully filled. Ensure that mortar does not encroach upon exposed faces. Finish mortar flush with masonry face.  
Other requirements: Exclude isolated hair line cracks (less than about 1.0 mm wide).
- 620 RESIN INJECTION REPAIR OF CRACKS  
Resin injection system manufacturer: Helifix.  
- Product reference: manufacturer's information.  
Preparation: Clean out cracks to remove debris, dust and dirt. Secure loose masonry units.  
Exposed faces: Keep clean and free from stains.  
Resin application: Use methods recommended by system manufacturer to fully bond masonry.  
Completion: After resin has cured, remove temporary crack plugging material and protective coatings.  
Pointing to cracks and injection holes: Compatible filler recommended by resin manufacturer, colour match to approval.
- 630 TIES to match existing  
Tie system manufacturer: submit proposals for approval.  
- Product reference: None.  
Type/ Diameter: to match existing.  
Grout: Manufacturer's requirement.  
Holes: Drill carefully and accurately, in locations shown on drawings, to suit types and lengths of tie. Remove drilling dust and debris.  
Adjacent masonry: Do not damage during drilling. Keep cavities behind facings free from debris.  
Tie installation:  
- Expansion type anchor fixings: Set to the correct torque.  
- Bonded ties: Grouted.  
- Ends of ties: Keep back from face of masonry to allow for making good.  
Exposed masonry faces: Clean and free from grout/ mortar stains.  
Making good: Repair mortar as clause 690.

**640 PINNING GENERALLY**

Dowels/ Pins:

- Type: Austenitic stainless steel threaded rods.
- Diameter: 6 mm.
- Additional requirements: Length of dowels 125 mm.

Resin: Low viscosity resin to approval.

Holes: Drill carefully, sloping downwards into the background. Remove drilling dust and debris and keep dry.

Filling holes:

- Check that dowel lengths are correct before filling with resin.
- Use sufficient resin so that when the dowel is inserted the resin is dispersed to achieve an effective repair.

Exposed faces: Keep clean and free from resin stains. Use temporary plugging material and/ or isolating membranes as necessary.

Clearances: Keep ends of ties and resin back from face of masonry.

Making good after resin has cured: Mortar as clause 690.

**675 JOINT REINFORCEMENT FOR STITCHING ACROSS CRACKS**

Existing construction: Cavity wall with brick outer leaf.

Joint width: 10 ± 2 mm.

Reinforcement system:

Manufacturer: Helifix.

Product reference: Helibar.

Type: 6mm diameter helical stainless steel.

Grout: As Helifix recommendations.

Installation: Remove existing mortar without damaging adjacent masonry or widening joints. Form recess to depth recommended by reinforcement manufacturer. Remove dust and debris. Install reinforcement using methods recommended by manufacturer.

Joints: Repoint as clause 820.

**690 MAKING GOOD TO INJECTION AND INSERTION HOLES**

Preparation: Clean out holes thoroughly.

Repair mortar: To match existing masonry units/ joints in colour and texture. Fill holes and finish mortar neatly and flush with surrounding masonry.

Finished appearance: Obtain approval for first set of holes before completing the remainder.

**692 MAKING GOOD TO TIE AND DOWEL INSERTION HOLES USING CORE DRILLED PLUGS**

Plugs: Cut plug from masonry face before drilling hole for each tie/ dowel. Where resulting plug is unusable, prepare plug from matching material.

- Plug diameter: Smallest practicable.

Holes: Clean.

Method of securing plug: A spot of epoxy resin and nonhydraulic lime:sand mortar.

Joints: To match existing.

Finished appearance: Obtain approval for first set of holes before completing remainder.

**GROUTING RUBBLE FILLED CORES**

**710 PREPARATION FOR GROUTING**

Grouting holes: Drill in joints at horizontal and vertical centres to suit coursing and to achieve an effective distribution of grout so that, on completion, all voids in masonry are filled.

Maximum height of each grout pour: Regulate to prevent disruption to masonry.

Open joints in masonry: Seal with an approved temporary material to prevent leaking of grout. Leave weep holes every two or three courses to assist in flushing out dust and debris, and to prove effectiveness of grouting. Locate temporary seal back from facework to allow for specified repointing. Seek instructions if repointing precedes grouting.

712 **FLUSHING OUT**  
Timing: Before grouting.  
Requirement: Flush out core of masonry walls using clean water delivered under moderate pressure through grouting holes.

720 **HAND GROUTING IN ASSOCIATION WITH REPOINTING C41/820**  
Grout mix: nonhydraulic lime grout subject to approval.  
Method: Direct grout into open joints using clay cups formed against masonry surface.  
Pour grout to refusal; allow to set; break off excess mortar and brush down masonry face.

740 **APPLICATION OF GROUTING**  
Grouting: Continuous operation during each lift. Allow grout to set before commencing subsequent lifts.  
Monitoring: Monitor grouting carefully and continuously at each delivery point (flow and delivery pressure), and at adjacent/ opposite wall faces, to ensure that there is an effective distribution of grout with no leaking, staining, or disruption to the masonry.  
Temporary seals: Remove on completion of grouting and leave joints in a suitable condition for repointing.

### **POINTING/ REPOINTING**

810 **PREPARATION FOR REPOINTING**  
Existing mortar: Working from top of wall downwards, remove mortar carefully, without damaging adjacent masonry or widening joints, to a minimum depth of 20 mm.  
- Loose or friable mortar: Seek instructions when mortar beyond specified recess depth is loose or friable and/ or if cavities are found.  
Raked joints: Remove dust and debris.

820 **POINTING BRICK CLADDING PANELS**  
Preparation of joints: Carefully brush away loose mortar.  
Mortar: As per specification.  
Mix: 1:1:6 cement:lime:sand.  
Sand source/ type: Crushed stone fine pointing sand to approval.  
Joints profile/ finish: Recessed back from weathered arrises to retain original joint widths.  
Brushed finish as clause 860.  
Other requirements: Grout deep voids as clause 720.

830 **INJECTION MORTAR POINTING GENERAL**  
Injection system: for masonry.  
Mortar:  
- Manufacturer: submit proposal for approval.  
Product reference: submit proposal for approval.  
Mix type: to manufacturer's requirements.  
Colour: to match existing.  
Joint profile/ finish: Recessed back from weathered arrises to retain original joint widths.  
Brushed finish as clause 860.  
Other requirements: Grout deep voids as clause 720.

840 **POINTING WITH TOOLS/ IRONS**  
General: Press mortar well into joints using pointing tools/ irons that fit into the joints, so that they are fully filled.  
Face of masonry: Keep clear of mortar. Use suitable temporary adhesive tape on each side of joints where necessary. Finish joints neatly.

850 **POINTING WITH INJECTION MORTAR**  
General: Inject mortar into joints so that they are fully filled with no voids.  
Face of masonry: Keep clear of mortar. Finish joints neatly.

860 **BRUSHED FINISH TO JOINTS**  
Timing: After initial mortar set has taken place remove laitance and excess fines by

brushing, to give a coarse texture. Do not compact mortar.



## C42 Repairing/ Renovating/ Conserving concrete

To be read with Preliminaries/General conditions.

### GENERAL

- 105 INFORMATION REQUIRED WITH TENDER  
Details of repair system including manufacturer and product references; data sheets; third party product certification.
- 110 SURVEY REPORT  
Ellis + Moore report, photographs, specification.
- 125 INVESTIGATIONS BY CONTRACTOR  
Purpose: To confirm location and extent of defects before repairs undertaken.  
Tests/ Observations:  
- Delamination - hammer sounding;  
- Cover to reinforcement using cover meter;  
- Carbonation depth using phenolphthalein test;  
- Chloride content; sampling by drilling and chemical analysis;  
- Chloride content; submit proposals; and  
- Condition and test methods from BS EN 1504-10 table 4 - 1 (delamination); 40 (cover meter); 11 (carbonation depth); 12 (chloride content); 36 (compressive strength; core and crushing test).  
- Location: Hammer soundings – as per Specification 2.5m grid.  
Period of notice to allow inspections (minimum): Three days.
- 130 INVESTIGATIONS BY EMPLOYER'S CONSULTANT  
Access to repair area: When scaffold is in position.  
- Notice: 3 days.  
Timing of instructions from date of each test: 3 days.  
Attendance and equipment to be provided for the following tests/ observations: Delamination (hammer sounding).
- 135 TEST RECORDS  
Submittals: Comprehensive records of results for each test including locations/ date/ time.  
- Timing of submissions following testing: Submit proposals.  
- Photographic records: Digital.  
Testing authority: United Kingdom Accreditation Service (UKAS) approved independent laboratory.
- 140 COORDINATION OF TEMPORARY WORKS  
Standard: To BS 5975.  
Falsework coordinator: Appoint a suitably qualified and experienced person.  
Responsibilities: In addition to those listed in BS 5975, clause 6.3.1.3, to ensure that:  
- Relevant requirements for temporary supports, whether known at the outset or discovered in the course of the repair works, are fully considered.  
- Removal of concrete/ reinforcement is only undertaken when it is safe to do so and temporary supports are in place.  
Period of appointment: From commencement of Contract until completion of repair works.

- 150 CONCRETE REPLACEMENT REPAIRS
- CORROSION INDUCED DAMAGE;
  - EXTERIOR SURFACES;
  - FLOOR SLABS;
  - COLUMNS;
  - CONCRETE FRAME;
  - INTERIOR SURFACES; and
  - WALKWAYS
- Location: As Ellis + Moore drawings in Appendix B and photographs.
- Concrete removal:
- Extent: Severely cracked concrete.
  - Limitations on removal: Submit proposals.
  - Method: Submit proposals.
- Reinforcement replacement:
- Extent: Obtain instructions.
  - Jointing: Submit proposals
- Reinforcement treatment: Refer to Specification
- Concrete replacement: Hand applied mortar.
- Finish: Levelling coat plus protective coating and Surface regularity compatible with existing adjacent concrete.
- Other requirements: Abseiling to carry out repairs not permitted.
- 155 CRACK REPAIRSON EXTERIOR SURFACES
- Location: As per elevation drawings in Appendix B and survey report.
- Crack types/ widths: As survey report.
- Primary function: Sealing against water and other adverse agents.
- Grouting material: submit proposals.
- Application method: Submit proposals.
- Finish: Suitable to receive protective coating and Corrosion inhibitor.
- Other requirements: Submit proposals for preparatory reduction of water leakage pressure.
- 160 MORTAR/ CONCRETE OVERLAYS GENERALLY
- Location: As survey report.
- Existing movement joints: Remove seals and extend joint filler through overlay prior to forming new joint seal.
- Additional treatment to concrete substrate: Corrosion inhibitor.
- Overlay material: Proprietary sprayed concrete.
- Finish: As shot, but free from rebound material.
- Control of thickness: Thickness measuring pins on a maximum 1.5 m grid.
- Other requirements: Bonded anchors between substrate and concrete.
- 165 PROTECTIVE COATINGS GENERALLY
- Location: As per elevation drawings.
- Additional treatment to concrete substrate: Corrosion inhibitor.
- Coating material: Proprietary; anti-carbonation.
- Other requirements: Submit proposals



- 180    **CONTRACTOR DESIGNED REPAIRS TO CORROSION INDUCED DAMAGE**  
Type of structure: In situ concrete framework and slabs with brickwork infill panels.  
Location of defects: Entire structure.  
Condition of structure:  
- As survey report;  
- Concrete spalling caused by corrosion of reinforcement due to carbonation of concrete;  
- Concrete spalling caused by corrosion of reinforcement due to chlorides in concrete; and  
- Concrete spalling due to frost damage.  
Design life: Remaining design life of the building.  
Other requirements: Existing profiles to cantilever beams to be retained.

## **PRODUCTS**

- 305    **PROPRIETARY REPAIR SYSTEMS**  
Products: Compatible and supplied by the same manufacturer as part of a total repair system.
- 310    **REPAIR MORTAR**  
Type: Polymer modified lightweight cementitious mortar (properties compatible with existing concrete).  
Manufacturer: See Specification.  
Product reference: Contractor's choice.
- 315    **PROTECTIVE COATING TO REINFORCEMENT**  
Type:  
- Epoxy resin modified cementitious slurry;  
- Polymer modified cementitious slurry; and  
- Zinc rich primer.  
Manufacturer: See Specification.  
- Product reference: Contractor's choice.
- 320    **LEVELLING/ SMOOTHING COATS**  
Type: Polymer modified cementitious mortar.  
Manufacturer: See Specification.  
Product reference: Contractor's choice.
- 325    **PROPRIETARY SPRAYED MORTAR/ CONCRETE**  
Type: Polymer modified cementitious mortar and Part of Agrément certified repair system.  
Manufacturer: See Specification.  
Product reference: Contractor's choice.
- 330    **PROPRIETARY SELF-COMPACTING CONCRETE FOR RECASTING**  
Type: submit proposals.  
Manufacturer: C See Specification.  
Product reference: Contractor's choice.
- 335    **PROPRIETARY CONCRETE FOR SMALL AREA REPAIRS**  
Type: Rapid setting and Agrément certified.  
Manufacturer: Submit proposals.  
Product reference: Submit proposals.
- 340    **CRACK/ VOID SEALING GROUTS**  
Type: Cementitious grout.  
Manufacturer: See Specification.  
Product reference: Contractor's choice.

345 PROTECTIVE COATINGS FOR CONCRETE

Type:

- Agreement certified;
- Crack bridging; and
- Part of Agreement certified repair system.

Manufacturer: See Specification.

Product reference: Submit proposals.

Colour: to match existing.

350 IMPREGNATIONS FOR PROTECTING CONCRETE

Type:

- Agreement certified;
- Silicone micro-emulsion; Agreement certified; and
- Hydrophobic.

Manufacturer: Submit proposals.

Product reference: Submit proposals.

355 CORROSION INHIBITOR IMPREGNATIONS

Type: Part of Agreement certified repair system.

Manufacturer: See Specification.

Product reference: Submit proposals.

Number of coats: to Manufacturer's specification

360 REINFORCEMENT GENERALLY

Standards:

- Steel: To BS 4449; BS 4482; BS 4483.
- Stainless steel: To BS 6744.

Strength grades: Subject to site investigation.

Cutting and bending: To BS 8666.

Suppliers: Firms holding a valid certificate of approval issued under a product certification scheme operated by a third party certification body with appropriate Category 2 accreditation from the United Kingdom Accreditation Service (UKAS).

## EXECUTION

605 EXECUTION GENERALLY

Standard: To BS EN 1504-10.

Operatives' skill and experience: Appropriate for the types of preparation and application.

Evidence: Submit on request.

610 QUALITY CONTROL DURING APPLICATION OF REPAIR SYSTEM

Tests/ Observations: Compressive strength of concrete replacement material.

Frequency: For each batch of concrete replacement material.

Criteria: Not less than that for existing concrete.

615 QUALITY CONTROL ON COMPLETED HARDENED REPAIR SYSTEM

Tests/ Observations: Compressive strength of concrete replacement material and Pull-off strength of concrete replacement material.

Frequency: As BS EN 1504-10, table 4..

Criteria: Not less than that for existing concrete.

- 625 **REMOVAL OF FITTINGS/ ATTACHMENTS**  
 Extent: The area of repair and any fittings/ attachments that could impede or be damaged by access.  
 Removal methods: Minimize damage to concrete/ reinforcement and to fittings/ attachments that are to be retained for reuse.  
 Items for disposal:  
 - Bird preventive devices;  
 - Isolated fasteners.;  
 - Cast-in fastenings.; and  
 - Electrical equipment.  
 Items for re-fixing after completion of repair work: As schedule.  
 - Storage: Prevent damage.  
 Other requirements: None.
- 630 **CLEANING CONCRETE SURFACES**  
 Extent: To reveal surface condition and aid investigation work. Minimize disruption to concrete surfaces and materials. Leave no harmful residual cleaning agents.  
 Methods: Submit proposals.
- 635 **TEMPORARY SUPPORTS/ PROPPING**  
 Standard: To BS 5975 and To BS EN 12812.  
 General: Prevent damage and overstressing to any part of structure during repairs.  
 Bearings for temporary supports/ propping: Suitable to carry loads throughout repair operations.  
 Location/ Extent of propping: Submit proposals.
- 640 **EXTENT OF CONCRETE REMOVAL FOR REINFORCEMENT TREATMENT/ REPLACEMENT**  
 Generally: The minimum necessary to allow treatment/ replacement, and to achieve thorough compaction of replacement material.  
 Edges of retained concrete: No undercutting or feather edges. Maintain edge angle within 90-135° or, where replacement material is spray applied, 110-135°.  
 Cutting: Prevent damage to reinforcement.  
 Removal of carbonated/ contaminated concrete: As schedule of works and Where chloride concentrations (by weight of cement) are greater than 0.3%.  
 Gap to expose full profile of bar: The greater of 15 mm or the maximum aggregate size of the repair material plus 5 mm.  
 Length of continuous uncorroded reinforcement to be exposed (minimum): 50 mm or, where reinforcement is to be replaced, 50 mm beyond the end of lap or joint.
- 645 **CLEANING REINFORCEMENT**  
 Standard of cleaning: To receive barrier type coatings - Sa2½ to BS EN ISO 8501-1 and Submit proposals where access for cleaning is difficult.
- 650 **ADDING/ REPLACING REINFORCEMENT GENERALLY**  
 Cleaning existing reinforcement: Sufficient to assess degree of section loss.  
 Removing reinforcement sections: Minimize disruption to retained reinforcement, retained concrete and bond between the two.  
 Cutting reinforcement:  
 - Cold worked reinforcement: Saw cut or shear.  
 - Hot rolled reinforcement when using welded or mechanical joints: Grind back burnt ends of reinforcement a minimum of 2mm.  
 Condition of new reinforcement: Free from corrosive pitting, loose mills scale, loose rust and contaminants which may adversely affect the reinforcement, the concrete replacement material, or bond between the two.  
 Compatibility of metals in contact: Select to prevent bimetallic corrosion.

- 655    **WELDING NEW REINFORCEMENT TO EXISTING**  
Standard: To BS EN ISO 17660-1 and -2 and BS EN 1992-1-1, clause 3.2.5.  
Joint type: Direct butt welds and Indirect butt welds using double flare-bevel welds to angle.  
Details: to manufacturer specification.  
Written welding procedures: Not required.  
Nature of existing reinforcement: Check. Submit proposals for welding procedure if cold worked reinforcement is to be welded.
- 660    **PREPARATION OF CONCRETE SUBSTRATES**  
Soundness: Remove loose or otherwise defective material and repair significant cracks and gaps.  
Preparation:  
-        Roughening for key: Grit blasting; thorough and even.  
-        Wetting of substrate: As recommendations of replacement material manufacturer.  
Condition immediately before placing replacement material:  
-        Cleanliness: Free from loose material, with no debris, tying wire clippings, and other matter that could adversely affect bond.  
Surface condition:     As recommendations of concrete replacement material manufacturer.
- 665    **FORMWORK FOR RECASTING**  
Generally: Accurately and robustly constructed to produce finished concrete to the required dimensions.  
-        Formed surfaces: Free from twist and bow.  
-        Intersections, lines and angles: Square, plumb and true.  
Joints in forms: Secure forms tight against existing concrete. Prevent loss of grout and formation of steps.
- 670    **GROUTING CRACKS/ VOIDS**  
Substrates: Clean. Keep free of detritus.  
Pressure: Minimum necessary to fill cracks completely. Leave no voids and prevent disruption to structure.
- 675    **CURING CONCRETE/ MORTAR**  
Requirement: Keep surface layers of concrete/ mortar moist throughout curing period, including perimeters and abutments, by either restricting evaporation or continuously wetting surfaces of concrete/ mortar.  
-        Surfaces covered by formwork: Retain formwork in position and, where necessary to satisfy curing period, cover surfaces immediately after striking.  
-        Top surfaces: If covering is removed for finishing operations, replace it immediately afterwards

## **COMPLETION**

- 710    **RECORD OF LOCATION/ EXTENT OF REPAIRS**  
Repair record forms:  
-        Content: Unique repair reference number for cross-referencing to record drawings; details of repair including dimensions and explanatory sketches; agreements and special requirements.  
-        Copies: 3.  
-        Source of record forms: Contractor's standard.  
Record drawings: Required on marked up contract drawings.