

## Horniman Museum - Sunken Garden Repairs

### Structural Specification

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## C41

### Repairing/ renovating/ conserving masonry

#### Generally/ preparation

##### 110 Scope of work

- Schedule: Various crack repairs and reconstruction of damaged masonry. Refer to Engineer's drawings for scope.
- 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, Contractor's representative, Foreman mason, Structural engineer.
- Timing: At least two working days before starting each section of work.
- Instructions issued during inspection: Confirm in writing, with drawings and schedules as required, before commencing work.

##### 130 Removal of plant growths from masonry

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

#### 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: Repointing, parapet reconstruction, crack repair, ground anchor and patress plate installation.

## **Material/ production/ accessories**

### **215 Material samples**

- Representative samples of designated materials: Submit to Client before placing orders.
  - Designated materials: Replacement bricks
- Retention of samples: Unless instructed otherwise, retain samples on-site for reference. Protect from damage and contamination.

### **240 Stone**

- Standard: Not applicable
- Supplier: Contractor's choice

- Type: To match existing copings
- Quality: Free from vents, cracks, fissures, discolouration, or other defects that may adversely affect strength, durability or appearance. Thoroughly seasoned, dressed and worked in accordance with shop drawings prepared by the supplier.
- Finish: Tooled to match existing

## **245 Replacement stone units**

- Sizes and profiles: To match existing masonry. Maintain existing joint widths.
- Sinkings for fixings, joggles and lifting devices: Accurately aligned and positioned in relation to existing masonry.

## **260 Bricks**

- Standard: To BS EN 771-1.
- Manufacturer: Submit proposals
- Size: To match existing

## **265 Salvaged and second hand bricks**

- Source: Dismantled sections of sunken garden walls and parapets
- Condition
  - Free from matter such as mortar, plaster, paint, bituminous materials and organic growths.
  - Sound, clean and reasonably free from cracks and chipped arrises.

## **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 makings to drawings/ photographs.

### **320 Rebuilding**

- Description: Damaged parapets, posts, and wall sections.
- Replacement materials: Brick as Clauses 260 & 265
- Mortar: As section Z21.
  - Standard: BS EN 998-2
  - Mix: ABOVE GROUND: 1:1:6 cement: nonhydraulic lime: sand. BELOW GROUND: 1:0.5:4 cement: nonhydraulic lime: sand.
  - Sand source/ type: Well graded sharp sand
- Rebuilding: To match previous face and joint lines, joint widths and bonding. Adequately bonded to retained work/ backing masonry, as appropriate.
- Joint surfaces: Dampen, as necessary, to control suction.
- Laying masonry units: On a full bed of mortar; perpend joints filled.
- Exposed faces: Remove mortar and grout splashes immediately.
- Joints: To match existing

## 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

- Description: Any brick which is significantly cracked, ruptured or otherwise damaged in area of masonry which is to be rebuilt.
- Bricks: As clause 260 and clause 265
- Mortar: As section Z21.
  - Standard: As clause 320
  - Mix: As clause 320
  - Sand source/ type: As clause 320

### 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.

### 405 Bonded dowels

- Description: FOR COPING STONE JOINTS AT HALF-BRICK PIERS
- Standard: BS EN 1090-1
- Dowels: Grade 316/1.4401 Austenitic stainless steel, 6mm diameter. Allow for 2no. per coping.
- Adhesive: HIT-HY 270  
INJECTION MORTAR
- Holes for dowels: Suitably sized and accurately aligned in masonry background and in rear of replacement/ insert stone; clean and dry.
- Other requirements: Do not use adhesive to bond stones at joints unless instructed.

### 406 Bonded Joint Ties

- Description: FOR COPING STONE JOINTS OVER WIDER PIERS OR CONTINUOUS WALLS
- Standard: Not applicable
- Ties: DPB type by ANCON. 40mm Height (including integral 6mm x 60mm dowel). Austenitic stainless steel.
- Fixings: Stainless steel screws and plugs into brickwork. Min. 5.0mm x 100mm.

- Adhesive: HIT-HY 270  
INJECTION MORTAR for dowels
- Holes for dowels: Suitably sized and accurately aligned in masonry background and in rear of replacement/ insert stone; clean and dry.
- Other requirements: Do not use adhesive to bond stones at joints unless instructed.

## **Tooling/ dressing stone in situ - Not Used**

## **Mortar repairs - Not Used**

## **Crack repairs/ ties/ reinforcement**

### **610 Mortar repair of cracks**

- Description: To all cracks in masonry walls.
  - Standard: BS EN 998-2
- Mortar: As section Z21.
  - Mix: As clause 320
  - Sand source/ type: As clause 320
- 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: Use ties across cracks as specified on 230331-CON-XX-XX-DR-S-4000, 4001

### **630 Ground Anchors**

- Description: TO EAST TERRACE - Ground anchors as specified on 230331-CON-XX-XX-DRS-S-4000
- Tie system
  - Standard: Not applicable
  - Manufacturer: Anchor Systems International
    - Product reference: Vulcan Earth Anchor
- Type/ Diameter: 16mm (Provisional)
- Grout: Cementitious grout to manufacturer's recommendation
- 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: As per manufacturer's instructions
- Exposed masonry faces: Clean and free from grout/ mortar stains.
- Making good: To suit patress plates.

### **675 Joint reinforcement**

- Description: As specified on 230331-CON-XX-XX-DR-S-4000 and 230331-CON-XX-XX-DR-S-4001

- Existing construction: Solid masonry wall
- Joint width: 10 +/- 3mm
- Reinforcement system
  - Standard: BS EN 1090-1
  - Manufacturer: LeviaT HeliFix
    - Product reference: HeliBar HB01
  - Type: 6mm
- Grout: HeliBond cementitious grout
- 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.

## **Grouting rubble filled cores - Not Used**

## **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 20mm.
  - 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**

- Description: Brickwork generally where mortar is damaged/recessed.
- Preparation of joints: As clause 810
- Mortar: As section Z21.
  - Standard: BS EN 998-2
  - Mix: 1:1:6 CEMENT:NONHYDRAULIC LIME:SAND
  - Sand source/ type: Well graded sharp sand
- Joint profile/ finish: To match existing
- Other requirements: Provide sample to client prior to construction.

### **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.

Ω End of Section



## **CON01**

### **General**

#### **Clauses**

#### **10 General**

- This Specification is to be read with preliminaries/general conditions.

#### **20 Do not scale drawings**

- The contractor is to check all dimensions on site before carrying out any works

#### **30 This specification**

- should be read together with the structural engineer's drawings which should be used to verify the works - any discrepancies are to be reported to the Contract Administrator before proceeding with the works.

#### **55 Weight of structural elements**

- Any element weighing more than 20kg should be lifted by double (or greater) handling or by using mechanical assistance. elements greater than 20kg have not been specified unless it has been necessary to do so and the contractor should make due allowance for the correct handling of heavier elements.

#### **60 Existing defects**

- The Contractor is to inform the Contract Administrator and structural engineer if the existing fabric, including foundations, is opened up and found to be inadequate, unsuitable to support the proposed works, or at variance from the details shown on the drawings.

#### **70 Items to be checked on site**

- Items noted on the drawings "to be checked or verified on site" are to be exposed by the contractor for inspection by the structural engineer at the earliest opportunity.

#### **80 Holes or chases**

- Must not be cut through any structural members without the written consent of the structural engineer.

#### **110 Contractor's duties**

- Nothing included or omitted from this outline specification will relieve the contractor of their duty to carry out the works in accordance with current standards of safety and good building practise.

#### **115 Materials**

- All articles, materials and goods shall be new and of good quality, suitable for the required purpose and shall conform to the appropriate British Standard where such exists. Where references to the above are made it shall be inferred that the latest edition applies, together with subsequent amendments, unless otherwise specified.

## 120 Tolerances

- All tolerances are to be agreed with the architect, and the contractor will be responsible for ensuring that sufficient tolerances are provided and integrated throughout all elements of the works.
- The Contractor is to take account of tolerances detailed elsewhere on the drawings, appended specifications, and British Standards when complying with the above clause.

Ω End of Section

**CON03****Construction design and management regulations****Clauses****10A CDM Regulations**

- in accordance with the construction (design and management) regulations 2015 a construction hazard assessment form has been completed by ourselves. the contractor must ensure that they familiarise themselves with the contents of this form prior to commencing the works.
- This form is appended to this specification.

**20 Method statement**

- The contractor should prepare a method statement covering the sequencing and temporary works proposals for the structural alterations. the statement should set out the order in which works are to be carried out and the layout and position of temporary works, providing calculations for these as required. a series of sketch drawings is often the best way to illustrate a complex series of works. the method statement should be submitted to the principal designer for comment 10 days prior to any works commencing.

Ω End of Section

## **CON04**

### **Temporary works and stability**

#### **Clauses**

#### **10 Stability**

- The Contractor is entirely responsible for maintaining the stability of all existing buildings and structures, within and adjacent to the works, and of all the works from the date of possession of the site until practical completion of the works.

#### **15 Design and supervision**

- Design and supervision of temporary works should be in accordance with BS5975: 2019.

#### **20 Contractor's temporary works proposals**

- The Contractor shall design, install and maintain all necessary temporary works and shall advise both the Contract Administrator and structural engineer at least ten working days from commencement of the works, of their proposals for temporary supports and sequence of construction for the works. these proposals shall be supported by design calculations if requested.
- Under no circumstances will any structural alterations be carried out prior to the Structural Engineer commenting on the Contractors temporary works proposals.

#### **30 The design of temporary works**

- Shall include an assessment of the loads to be resisted and is to be undertaken by a competent person. due regard shall be given to lateral stability as well as to the support of vertical loads.

#### **40 Existing loadings**

- The Contractor is to familiarise themselves with the building and its structure so that they are aware of the nature and magnitude of the loads to be supported.

#### **70 The contractor**

- The contractor shall ensure that any completed or partially completed structural element is not overloaded by storage of materials, demolition debris or plant used in the works. details of permitted loads may be obtained from the structural engineer.

#### **90 Excavations**

- Shall in no circumstances encroach within 45° of the bottom near side of any existing foundation.

Ω End of Section

## CON05 Demolition

### Clauses

#### 10 Demolition

- Is to be carried out in accordance with BS 6187 and current relevant health and safety legislation and hse guidance.

#### 12 Operatives

- Should be appropriately experienced and skilled in this type of work, holding relevant citb certificates of competence.

#### 15 Site staff

- Staff responsible for supervision and control of work should be experienced in the assessment of the risks involved and methods of deconstruction and demolition to be used.

#### 20 Demolition sequence

- Demolition is to be undertaken in the reverse order of construction. No part of the structure is to be left in an unsupported condition overnight or for long periods.

#### 30 Demolition good practice

- Is to be undertaken in a manner which avoids excessive noise and nuisance.
- All work is to be well-watered to minimise dust. All non-retained material is to be carted away from site as soon as practicable.

#### 50 Recycled materials

- Arising from the demolition/deconstruction work can be reused elsewhere in the project subject to compliance with the appropriate specification and in accordance with the site waste management plan.

#### 60 Asbestos-containing materials – unknown occurrences

- Discovery: Give notice immediately of suspected asbestos-containing materials when discovered during deconstruction/ demolition work. avoid disturbing such materials.
- Removal: Submit statutory risk assessments and details of proposed methods for safe removal.

#### 70 Unforeseen hazards

- Discovery: Give notice immediately when hazards, such as unrecorded voids, tanks, chemicals, are discovered during deconstruction/ demolition.
- Removal: Submit details of proposed methods for filling, removal, etc.

Ω End of Section

## CON06

### Excavating and filling

#### Clauses

#### 10C Site information is not available

- From consultation of the geological survey records for the area it appears that the underlying soil is likely to be firm clay. However, the Contractor is to make all necessary enquiries concerning the nature and location of soils and strata

#### 20A Ground water

- Level on the site is not known.

#### 30 Existing services

- Inspect all available drawings and make enquiries about existing services on site. verify positions and depth of all services before commencement of work on site. Services which are being retained during any phase of the works are to be protected.

#### 35 Obstructions

- Recorded foundations, beds, drains, etc: Break out and seal off drain ends. remove contaminated earth.
- Unrecorded foundations, beds, basements, filling, tanks, service pipes, drains, etc: Give notice.

Ω End of Section

## CON09 Masonry

### Clauses

#### 10 Workmanship

- Is to comply generally with BS 5628 parts 1 & 3. Brickwork, blockwork and masonry to be to BS EN 771

#### 15 Weight of masonry units

- Where possible, masonry walls have been designed to use units with a maximum weight of 20kg. where this has not been possible, units must be lifted using mechanical assistance or double-handling.

#### 20 New facing brickwork above DPC

- Use HD units F1 or F2, S1 or S2, set in Class (iii) mortar unless noted otherwise on the drawings
- New bricks to provide good visual match to existing historic brickwork. Provide samples for client approval before ordering.

#### 25 New brickwork below Ground Level

- Use HD units F1 or F2, S1 or S2 set in Class (ii) mortar unless noted otherwise on the drawings. For S1 units use sulphate resistant cement. F1 units not to be used in areas at high risk of freezing.

#### 50 Brickwork and blockwork bonding

- Brickwork and blockwork are to be laid properly bonded and fully bonded into existing work or as specified otherwise on the drawings. All perpendes must be fully filled with mortar.

#### 60 Straight joints between new and existing masonry

- Do not use unless agreed with CA and Structural Engineer
- If agreed, tie using suitable wall profiles by Furfix or similar. To be galvanised internally and stainless steel externally. External joints to be finished with mastic as clause 100.

#### 70 Ambient temperature

- Do not lay masonry when the ambient air temperature is less than 5°C.

#### 90 Movement joints in facing brickwork

- Joints in facing brickwork are to be formed by building in 'Aerofil 1' joint filler by GCP Applied Technologies Inc, as the works proceed ensuring no projections into cavities. In joints to be pointed with sealant, position filler accurately at the recommended distance from the face of wall. Leave joints open for as long as possible before sealing with appropriate sealant to architects' specification.

Ω End of Section

## Z20

### Fixings and adhesives

#### Products

##### 310 Fasteners generally

- Materials: To have:
  - Bimetallic corrosion resistance appropriate to items being fixed.
  - Atmospheric corrosion resistance appropriate to fixing location.
- Appearance: Submit samples on request.

##### 320 Packings

- Materials: Noncompressible, corrosion proof.
- Area of packings: Sufficient to transfer loads.

##### 340 Masonry fixings

- Light duty: Plugs and screws.
- Heavy duty: Expansion anchors or chemical anchors.

##### 350 Plugs

- Type: Proprietary types to suit substrate, loads to be supported and conditions expected in use.

##### 380 Miscellaneous screws

- Type: To suit the fixing requirement of the components and substrate.
  - Pattern: Self-tapping, metallic drive screws, or power driven screws.
- Washers and screw cups: Where required to be of same material as screw.

#### Execution

##### 610 Fixing generally

- Integrity of supported components: Select types, sizes, quantities and spacings of fixings, fasteners and packings to retain supported components without distortion or loss of support.
- Components, substrates, fixings and fasteners of dissimilar metals: Isolate with washers/ sleeves to avoid bimetallic corrosion.
- Appearance: Fixings to be in straight lines at regular centres.

##### 620 Fixing through finishes

- Penetration of fasteners and plugs into substrate: To achieve a secure fixing.

##### 630 Fixing packings

- Function: To take up tolerances and prevent distortion of materials and components.
- Limits: Do not use packings beyond thicknesses recommended by fixings and fasteners manufacturer.
- Locations: Not within zones to be filled with sealant.



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Z20

Ω End of Section

## Z21 Mortars

### Cement gauged mortars

#### 110 Cement gauged mortar mixes

- Specification: Proportions and additional requirements for mortar materials are specified elsewhere.

#### 120 Sand for site made cement gauged masonry mortars

- Standard: To BS EN 13139.
- Grading: 0/2 (FP or MP).
  - Fines content where the proportion of sand in a mortar mix is specified as a range (e.g. 1:1: 5-6):
    - Lower proportion of sand: Use category 3 fines.
    - Higher proportion of sand: Use category 2 fines.
- Sand for facework mortar: Maintain consistent colour and texture. Obtain from one source.

#### 135 Site made lime:sand for cement gauged masonry mortars

- Permitted use: Where a special colour is not required and in lieu of factory made ready-mixed material.
- Lime: Nonhydraulic to BS EN 459-1.
  - Type: CL 90S.
- Mixing: Thoroughly mix lime with sand, in the dry state. Add water and mix again. Allow to stand, without drying out, for at least 16 hours before using.

#### 160 Cements for mortars

- Cement: To BS EN 197-1 and CE marked.
  - Types: Portland cement, CEM I.
    - Portland limestone cement, CEM II/A-L or CEM II/A-LL.
- Portland slag cement, CEM II/B-S.
- Portland fly ash cement, CEM II/B-V.
  - Strength class: 32.5, 42.5 or 52.5.
- White cement: To BS EN 197-1 and CE marked.
  - Type: Portland cement, CEM I.
  - Strength class: 52.5.
- Sulfate resisting Portland cement
  - Type: To BS EN 197-1 Sulfate resisting Portland cement, CEM I/SR and CE marked.
- To BS EN 197-1 fly ash cement, CEM II/B-V and CE marked.
  - Strength class: 32.5, 42.5 or 52.5.
- Masonry cement: To BS EN 413-1 and CE marked.
  - Class: MC 12.5.

## **180 Admixtures for site made cement gauged mortars**

- Air entraining (plasticizing) admixtures: To BS EN 934-3 and compatible with other mortar constituents.
- Other admixtures: Submit proposals.
- Prohibited admixtures: Calcium chloride, ethylene glycol and any admixture containing calcium chloride.

## **200 Storage of cement gauged mortar materials**

- Sands and aggregates: Keep different types/ grades in separate stockpiles on hard, clean, free-draining bases.
- Factory made ready-mixed lime:sand/ ready to use retarded mortars: Keep in covered containers to prevent drying out or wetting.
- Bagged cement/ hydrated lime: Store off the ground in dry conditions.

## **210 Making cement gauged mortars**

- Batching: By volume. Use clean and accurate gauge boxes or buckets.
  - Mix proportions: Based on dry sand. Allow for bulking of damp sand.
- Mixing: Mix materials thoroughly to uniform consistency, free from lumps.
  - Mortars containing air entraining admixtures: Mix mechanically. Do not overmix.
- Working time (maximum): Two hours at normal temperatures.
- Contamination: Prevent intermixing with other materials.

## **Lime:sand mortars - Not Used**

Ω End of Section

