

Donald Insall Associates

Rochdale Borough Council

Broadfield Park Slopes, Rochdale

Broadfield Park Slopes, Rochdale

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18-10-2024

Repairs and Improvements to Broadfield Park Slopes,
Rochdale

Contents

C20 Demolition	1
C40 Cleaning masonry/ concrete.....	4
C41 Repairing/ renovating/ conserving masonry	10
F20 Natural stone rubble walling	21
L30 Stairs/ ladders/ walkways/ handrails/ balustrades	24
M60 Painting/clear finishing	27
Q20 Granular sub-bases to roads/ pavings	31
Q25 Slab/ brick/ sett/ cobble pavings.....	34
Z11 Purpose made metalwork	40
Z21 Mortars.....	44

C20

Demolition

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

To be read with preliminaries/ general conditions.

10 Extent of deconstruction/ demolition

1. General: Carefully take down sections of walls affected by settlement down to Foundation level. Break up and dig out foundations. Retain masonry for rebuilding. Refer to drawings 2200, 2203, 2205, 2206 and to engineers drawings.

15 Benchmarks

1. Unrecorded benchmarks and other survey information: Provide appropriate notification to Ordnance Survey if unrecorded benchmarks are found.
2. Give notice when found. Do not remove marks or destroy the fabric on which they are found

20 Features to be retained

1. General: Keep in place and protect the following: Adjacent walls where sound. Retain existing copings for reinstatement. Retain existing stone for rebuilding the walls. Retain flags for reinstatement.

25 Location and marking of services

1. Services affected by deconstruction/ demolition work: Locate and mark positions
2. Mains services marking: Arrange with the appropriate authorities for services to be located and marked
 - 2.1. Marking standard: In accordance with Street Works UK publication 'Guidance on the Positioning and Colour Coding of Underground Utilities' Apparatus'.
3. Existing services: Electrical services serving former obelisk light fittings presumed to be obsolete and disconnected. However check with cable detectors prior to excavation and dismantling work.

45 Services to be retained

1. Existing services: All existing services i.e fountain water supply and outflow are to be renewed - refer to Price and Myers drawing 6002.

50 Workmanship

1. Standard: Demolish structures in accordance with BS 6187.
2. Operatives
 - 2.1. Appropriately skilled and experienced for the type of work.
 - 2.2. Holding, or in training to obtain, relevant Construction Skills certification of competence.
3. Site staff responsible for supervision and control of work: Experienced in the assessment of risks involved and methods of deconstruction and demolition to be used.

65 Structures to be retained

1. Extent: As drawings 2200, 2203, 2205, 2006.
2. Interface between retained structures and deconstruction or demolition: Cut away and strip out with care to minimize the amount of making good needed. Retain original stone for rebuilding the walls.

70 Partly demolished structures

1. General: Leave in a stable condition, with adequate temporary support at each stage to prevent risk of uncontrolled collapse. Make secure outside working hours.
2. Temporary works: Prevent overloading due to debris.
3. Access: Prevent access by unauthorized persons.

71 Dangerous openings

1. **General:** Provide guarding at all times, including outside of working hours. Illuminate during hours of darkness.
2. **Access:** Prevent access by unauthorized persons.

76 Asbestos-containing materials – unknown occurrences

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

78 Unforeseen hazards

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

95 Recycled materials

1. **Materials arising from deconstruction and demolition work:** Can be recycled or reused elsewhere in the project, subject to compliance with the appropriate specification and in accordance with any site waste management plan.
2. **Evidence of compliance:** Submit full details and supporting documentation.
 - 2.1. **Verification:** Allow adequate time in programme for verification of compliance.

Ω End of Section

C40

Cleaning masonry/ concrete

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

General/ preparation

110 Scope of work

1. Cleaning of dark staining and green algal staining to inner walls around the fountain only.
2. The intent is to enhance and harmonise the appearance of the architectural and masonry detailing to the inner walls around the fountain by removal of the organic covering and localised aesthetic disfigurements.
3. Stonework: remove organic and particulate soiling. Remove/significantly reduce localised surface carbonaceous pollution residue. Subsurface insoluble discolorations will remain.

111 Recommendations

1. Carry out protections in accordance with clauses 160.
2. Workmanship and execution shall be carried out in accordance with clauses 112, 190, 195 and 215.
3. Undertake trials to approval in accordance with 230.
4. Co-ordinate and sequence cleaning with related repair and remedial works - fountain lining etc in accordance with clause 120.
5. Before commencing any other method of cleaning, remove loosely adhered deposits and heavy deposits of biological matter through brushing and scraping - see clause 311.
6. Remove flexible soiling (organic residue) and lightly adhered particulate matter from masonry using the Therma Tech superheated water system. Follow the guidance in clause 352.
7. Where necessary repeat the Therma Tech cleaning after a dwell time of 1-24 hours to further reduce organic soiling to the level agreed.
8. Use the Vor Tech swirl abrasive method to reduce the intensity of localised surface carbon residue (inducing a colour change from dark black to translucent grey). Follow the guidance in clause 360.
9. A degree of sub surface patination may remain.
10. Sequencing for walls as follows:
 - 10.1. Commence at the top of the walls and work methodically downwards.
 - 10.2. Use the Therma Tech system to remove flexible soiling (principally organic films and growth) and loose particulate.
 - 10.3. Use the VorTech swirl air abrasive method to reduce localised and intense carbon residue.
 - 10.4. Carefully rinse after cleaning and 'cutting out' is completed - see clause 353. Whether this is done before or after repointing is to be agreed with the Architect and the Stone mason Contractor.

112 Workmanship

1. The key to success in the cleaning of the stonework is the skill and experienced use of the proposed cleaning systems achieved in the hands of the operators - see clauses 352, 353, 356 and 360).
2. The extent and clean across the surfaces will require considered and retrained selection, together with careful blending and not over working. The skill of the operator will be important as it will require judgement on how far to go and when to stop.
3. The effectiveness of the cleaning systems is dependent on the adjustment of the distance, angle and pressure of the nozzle in the hands of the operator.
4. Provide methodologies, experience and name of the proposed sub contractor at the time of tender. Provide cv' of operatives demonstrating experience, skill and knowledge of working on similar buildings of stone type and complexity.

120 Related repair and remedial works

1. **Work to be carried out before cleaning work:** Remove vegetation; where practical remove defective masonry and pointing before cleaning - sequencing to be agreed with Architect.
2. **Work to be carried out after cleaning work:** Pointing to joints in masonry, as section C41. Repairs to masonry where blocks are missing.
3. **Related works to fountain::** Co ordinate stone cleaning work with works to provide new fountain lining and new water inlet and outlet pipework.

142 Removal of fittings

1. **Timing:** Before commencement of cleaning work
2. **Disturbance to surfaces:** Minimize.
3. **Items for disposal:** Metal railings.

160 Protection

1. **Water courses:** Prevent egress of any water containing masonry biocides into the sw drainage and into the water courses. Polythene ground sheets to be used to prevent to be used to retain liquid run off to prevent this getting into water courses. non woven geotextile membrane to be used to collect solid residues.
2. **Surfaces not designated for cleaning:** Prevent damage, including marking and staining.
3. **Temporary mechanical fastenings**
 - 3.1. **In masonry:** Locate in joints.
 - 3.2. **In other surfaces:** Seek instructions.

175 Control and disposal of wash water and detritus

1. **Disposal:** Safely. Obtain approvals from relevant Authority.
2. **Control of wash water:** Collect and divert to prevent ingress and damage to building fabric and adjacent areas.
3. **Above and below ground drainage systems:** Keep free from detritus and maintain normal operation.
4. **Supply of potable water:** Contractor to provide supply of potable water to the fountain area, sufficient to supply the cleaning equipment. Wash water or residue is not to be permitted to enter a water course. No solid residue will be permitted to enter the drainage system - solid residue is to be secured for off site disposal.

180 Cold weather

1. **Cleaning procedures using water:** Do not use when air temperature is at or below 5°C. Protect damp surfaces from frost.
2. **Chemical cleaning agents:** Do not use when surface temperatures are below those recommended by manufacturer.

190 Cleaning generally

1. **Timing:** Works may not start on site until all necessary approvals are received from the local planning authority conservation officer
2. **Operatives:** Appropriately trained and experienced for each type of cleaning work.
 - 2.1. **Evidence of training:** Submit on request.
3. **Control of cleaning:** Confine cleaning processes and materials to designated areas. Prevent wind drift.
4. **Detritus:** Remove regularly. Dispose of safely.
5. **Monitoring**

- 5.1. Frequently check results of cleaning compared to approved trial samples. If results established by trials are not achieved, seek instructions.
- 5.2. Works to be inspected and approved in accordance with the requirements of the local planning authority.
6. Modifications to cleaning methods and materials: Seek instructions.

195 Monitoring

1. Check frequently the effects of each cleaning procedure against the degree of cleaning established in the trial sample.

215 Record of cleaning works

1. **Written report:** Record cleaning methods and procedures used for each type of surface and deposit.
 - 1.1. **Content:** Relevant attributes of cleaning methods used including:
 - 1.1.1. Equipment and settings.
 - 1.1.2. Dwell times.
 - 1.1.3. Number of applications.
 - 1.1.4. Ambient temperatures.
2. **Submission:** At completion of cleaning works.

230 Trial samples

1. **Trial sample reference:** Carry out a trial sample of each cleaning procedure for Architect/Local Authority conservation officer approval.
 - 1.1. **Surface:** Sandstone.
 - 1.2. **Location/ Size:** 600x600mm square area to walls inside the fountain.
 - 1.3. **Type of soiling:** Biological growths. Atmospheric soiling
 - 1.4. **Cleaning methods:** Surface biocides. Steam
2. **Records:** Maintain written records for each trial area, including cleaning methods and conditions, to enable replication of results elsewhere.

Products/ equipment

311 Brushing and scraping

1. Before commencing any other method of cleaning, remove loosely adhered deposits and heavy deposits of biological matter using suitable non ferrous and corrosion resistant brushes and scrapers/spatulae that do not abrade or gouge the surface.
2. For brush cleaning use brushes of nylon or natural bristle or approved non ferrous and corrosion resistant fine filament metal brushes.
3. Scrapers /spatulas to have wooden or plastic blades or approved flexible stainless blades.
4. Collect debris in a buckets/containers as works proceed and dispose of in accordance with health and safety requirements.

312 Surface biocides

1. **Types:** Registered by the Health and Safety Executive (HSE) and listed on the HSE website under non-agricultural pesticides.
2. **Compatibility with surface:** Free from staining or other harmful effects.

322 Abrasive cleaning equipment

1. **Manufacturer/ Supplier:** Vortech.

- 1.1. Product reference: Swirl.
2. Nozzle types: Subject to site trials
3. Abrasives: Subject to site trials

352 Steam cleaning equipment

1. Manufacturer: Restorative Techniques Ltd or similar approved.
 - 1.1. System equipment type:: Therma Tech Superheated water system.

372 Plain poultices

1. Description: FOR IRON STAIN REMOVAL
2. Poulticing medium manufacturer: Restorative Techniques
 - 2.1. Product reference: Restorative iron stain poultice
3. Softening agent: Deionized water.
4. Application:: To manufacturers recommendations.

Application

412 Removal of loosely adhered deposits

1. Timing: Before commencement of other cleaning methods.
2. Surfaces: Prevent damage, including abrasion.

422 Biocide application

1. Preparation: Dampen dry growths. Remove loose growths
2. Surfaces: Prevent damage, including abrasion.
3. Biocide treatment: Appropriate solutions to kill growths and inhibit further growths.
 - 3.1. Dead growths: Remove.

452 Abrasives cleaning

1. Surfaces: Minimize abrasion.
 - 1.1. Ingrained deposits: Seek instructions.
2. Equipment settings (including nozzle type and distance from surface): Adjust regularly to achieve optimum cleaning performance for each surface.
3. Detritus: Remove with clean water.

482 Steam cleaning

1. Surfaces: Prevent damage, including abrasion.
2. Equipment settings (including nozzle type and distance from surface): Adjust regularly to achieve optimum cleaning performance for each surface.

515 Plain poulticing

1. Surfaces: Prevent damage, including abrasion.
2. Application: To wetted surfaces. Maintain contact with surfaces as poultice dries out.
3. Poultice reinforcement: Plastics mesh
4. Drying: Prevent excessively rapid or localized drying out.
5. Spent poultice material: Do not reuse.

Ω End of Section

C41

Repairing/ renovating/ conserving masonry

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

Generally/ preparation

110 Scope of work

1. **Schedule:** Localised rebuilding of walls; resetting copings; repointing - refer to drawings.
2. **Records of masonry to be repaired:** Before starting work, use measurements and photographs as appropriate to record bonding patterns, joint widths, special features, etc.
3. **Identification of masonry units to be removed, replaced or repaired:** Mark clearly, but not indelibly, on face of masonry units or parts of units to be cut out and replaced. Transcribe markings to drawings/ photographs.

111 Review of scope of repair upon close inspection

1. Provide access and access scaffold to the inner walls to the fountain and clear vegetation from other wall areas to enable Architect to make a close inspection.
2. Provide attendance and inspect the work with the Architect to confirm the nature and extent of the cutting out and preparation of voids as identified on the drawings.
3. Make a record of instructions given during the inspections, which may either confirm or vary scope of work, and measure and record relevant details, as clause 121.
4. Prepare and submit details of instructions for confirmation.
5. Prepare schedules and drawings for use as basis of implementation work.

120 Site inspection

1. **Purpose:** To confirm type and extent of repair/ renovation/ conservation work shown on drawings and described in survey reports and schedules of work.
 - 1.1. **Item:** To confirm extent of taking down walls for rebuilding due to settlement
 - 1.2. **Item:** To confirm extent of taking down of inner wall facing to insert conduit within the wall and the final positioning of wall lights.
2. **Parties involved:** Contract administrator. Architect. Contractor's representative. Foreman mason. Structural engineer
3. **Timing:** At the earliest opportunity.
4. **Instructions issued during inspection:** Confirm in writing, with drawings and schedules as required, before commencing work

125 Removal of fittings/ fixtures

1. **Items to be removed, and reinstated on completion of repair work:** Stone copings; stone obelisks
 - 1.1. **Identification:** Attach labels or otherwise mark items using durable, non-permanent means, to identify location and describe refixing instructions, where applicable.
 - 1.2. **Treatment following removal:** Copings - removal of any ferrous cramps. Stone obelisks - removal all remaining fixing bolts for old lamps.
 - 1.3. **Storage:** Protect against damage, and store until required.
 - 1.3.1. **Storage location:** Secure, on-site
 - 1.4. **Reinstatement:** Refit in original locations using original installation methods.
2. **Items unsuitable or not required for reuse:** Existing railings around the fountain including fixings
 - 2.1. **Disposal:** Cart away
3. **Masonry fabric and surfaces:** Do not damage during removal and replacement of fittings/ fixtures.

130 Removal of plant growths from masonry

1. **Plants, root systems and associated soil/ debris:** Carefully remove from joints, voids and facework.
2. **Removal of roots:** Where growths cannot be removed completely without disturbing masonry seek instructions.

3. **Lichen:** Do not remove lichen.
4. **Moss:** Remove as much moss growth as possible without damaging the stone beneath using knife blades, spatulae and stiff bristle or non ferrous phosphor bronze soft wire brushes.
5. **Biocides:** Use suitable biocides (multiple if necessary) specific to the purpose and use in accordance with the manufacturers recommendations. Protect adjacent areas of walling from unwanted spray. Prevent biocides from entering watercourses.
6. **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.
7. **Tools:** Use hand tools only - loppers, handsaws, wood or plastic scrapers, natural and/or brass wire brushes.

140 Record of work

1. **General:** Record work carried out to masonry clearly and accurately using written descriptions, sketches, drawings and photographs, as necessary.
2. **Specific records:** Photographs prior to commencement - record sections of wall to be rebuilt; record condition of stones to be removed during and after removal - record the depth of the stone. Photograph upon completion.
3. **Documentation:** Submit on completion of the work.
 - 3.1. **Number of sets:** One - electronic

141 Recording to approval of CA

1. Clearly mark by appropriate means the defective stones or parts of stones to be cut out.
2. Record by photograph or other approved method, stones to be cut out for repair or for installation of services and /or missing stones to be reinstated, and the relationship of surrounding work. Note bond, joint size, style and texture of pointing and any special or unusual feature for replication.
3. Record by photograph the extent of walling to be taken down and rebuilt as agreed with the Structural Engineer, so that the walling can be rebuilt to existing pattern.
4. Cross reference identified and marked stones for cutting out and/or missing stones for reinstatement to drawings or photographs.

Workmanship generally

150 Power tools

1. **Usage for removal of mortar:** Not permitted

155 Putlog scaffolding

1. **Usage:** Not permitted

160 Protection of masonry units and masonry

1. **Masonry units:** Prevent overstressing during transit, storage, handling and fixing. Store on level bearers clear of the ground, separated with resilient spacers. Protect from adverse weather and keep dry. Prevent soiling, chipping and contamination. Lift units at designed lifting points, where provided.
2. **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

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

170 Disturbance to retained masonry

1. Retained masonry in the vicinity of repair works: Disturb as little as possible.
2. Existing retained masonry: Do not cut or adjust to accommodate new or reused units.
3. Retained loose masonry units and those vulnerable to movement during repair works: Prop or wedge so as to be firmly and correctly positioned.

180 Workmanship

1. Skill and experience of site operatives: Appropriate for types of work on which they are employed.
 - 1.1. Documentary evidence: Submit on request.
2. Sub contracting: Sub contractors to a specialist masonry contractor allowed.
3. Trainee and apprentices: Permitted subject to full supervision. The contractor shall be responsible for cost and programme implications for making good any defective work or work not carried out to the required standard.

182 Protection

1. Store dressed stone clear of the ground; separate with resilient spacers; protect from adverse weather.
2. Prevent soiling, chipping and contamination by salts and other deleterious substances.
3. Prevent damage to stonework, especially arrises and projecting features. Protect with suitable slats boards etc and remove at practical completion.
4. Prevent staining and other disfigurement of stonework during the course of subsequent works.
5. Turn back scaffold boarding (eg around the inner walls to fountain) at night and during heavy rain.

185 Adverse weather

1. General: Do not use frozen materials or lay masonry units on frozen surfaces.
2. Air temperature: Do not bed masonry units or repoint:
 - 2.1. In cement gauged mortars when ambient air temperature is at or below 3°C and falling or unless it is at least 1°C and rising, unless mortar has a minimum temperature of 4°C when laid and the masonry is adequately protected.
 - 2.2. In hydraulic lime:sand mortars when ambient air temperature is at or below 5°C and falling or unless it is at least 3°C and rising.
 - 2.3. In nonhydraulic lime:sand mortars in cold weather, unless approval is given.
3. Temperature of the work: Maintain above freezing until mortar has fully set.
4. Rain, snow and dew: Protect masonry by covering during precipitation, and at all times when work is not proceeding.
5. Hot conditions and drying winds: Prevent masonry from drying out rapidly.
6. New mortar damaged by frost: Rake out and replace.

186 Warm dry weather

1. In warm dry weather keeps areas damp for a minimum of four hours before pointing and three days after.

Materials/ production/ accessories

240 Stone

1. Standard: Not applicable
2. Supplier: n/a - use matching stone from client store on site.

3. **Quality:** Free from vents, cracks, fissures, discolouration, or other defects that may adversely affect strength, durability or appearance. Thoroughly seasoned.
4. **Finish:** Walling stone - rough dressed or rock faced to match existing. Replacement copings and dressings - tooled to match existing.

245 Replacement stone units

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

250 Stone orientation

1. **Orientation of natural bed**
 - 1.1. In plain walling: Horizontal.
 - 1.2. In projecting stones and copings: Vertical and perpendicular to wall face.
 - 1.3. In arches: Perpendicular to line of thrust.

255 Ashlar blocks/ Dressings

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

280 Proprietary fixings

1. **Description:** FOR COPINGS
2. **Standard:** To BS EN 1090-1
3. **Manufacturer:** Anchon or equal
 - 3.1. **Product reference:** Frame cramps
4. **Material:** Austenitic stainless steel
5. **Size:** To engineers requirements. Allow for 2 no frame cramps per coping unit.

281 Fixings

1. **Description:** FOR REPLACEMENT STONE OBELISK
2. **Type:** As engineers details
3. **Material:** Austenitic stainless steel
4. **Size, strength and number:** As necessary to resist loads likely to occur during the life of the building, and to prevent lateral displacement or pulling apart of the construction.

Dismantling/ rebuilding

310 Dismantling masonry for reuse

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

315 Preparing beds and backing

1. Remove all unwanted bedding and backing material, fixings and similar items from voids left where defective stones have been cut out and/or where stones are missing.

2. Rake and clean cavities to provide sound hard surfaces for replacement stones.
3. Remove dust throughout by bristle brush and with a vacuum cleaner if necessary.

320 Rebuilding

1. **Description:** Walls where affected by settlement
2. **Replacement materials:** Stone, as clause 240
3. **Mortar:** As section Z21.
 - 3.1. **Standard:** BS EN 998-2
 - 3.2. **Mix:** 1:2½ NHL 3.5 hydraulic lime:sand
 - 3.3. **Sand source/ type:** As Z21 320.
4. **Fixings:** n/a unless specified by the engineer
5. **Rebuilding:** To match previous face and joint lines, joint widths and bonding. Adequately bonded to retained work (to be toothed in)/ backing masonry, as appropriate.
6. **Joint surfaces:** Dampen, as necessary, to control suction.
7. **Laying masonry units:** On a full bed of mortar; perpend joints filled.
8. **Exposed faces:** Remove mortar and grout splashes immediately.
9. **Joints:** Flush - brush back slightly to suit weathered arrises.
10. **Other requirements:** None

Replacements and insertions

330 Preparation for replacement masonry

1. **Defective material:** Carefully remove to the extent agreed. Do not disturb, damage or mark adjacent retained masonry.
2. **Existing metal fixings, frame members, etc.:** Report when exposed.
3. **Redundant metal fixings:** Remove.
4. **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.

340 Replacement of stone

1. **Description:** WHERE STONE IS MISSING OR DEFECTIVE
2. **Stone:** Sandstone, as clause 240
3. **Bedding depths:** 100 mm or full depth
4. **Mortar:** As section Z21.
 - 4.1. **Standard:** BS EN 998-2
 - 4.2. **Mix:** 1:2½ NHL 3.5 hydraulic lime:sand
 - 4.3. **Sand source/ type:** As Z21 320.
5. **Fixings:** Dowels and cramps
6. **Joints:** Recessed weathered, with stipple finish, as clause 860

385 Laying replacement masonry units

1. **Exposed faces of new material:** Keep to agreed face lines.
2. **Accuracy:** .
 - 2.1. **Courses:** Level and true to line.
 - 2.2. **Faces angles and features:** Plumb.

- 2.3. **Setting out::** Achieve satisfactory junctions and joints with adjoining or built in elements and components. Set out new stone back to the original building line. Provide discreet lime mortar weatherings on horizontal shelves as a result of this requirements.
3. **Joint surfaces:** Dampen to control suction as necessary.
4. **Laying units:** On a full bed of mortar, all joints filled.
5. **Exposed faces:** Keep clear of mortar and grout.
6. **Appearance::** Neat and consistent.
7. **Cleanliness::** Keep facework clean. Rubbing and other abrasive or chemical cleaning methods to remove marks and stains not permitted.

395A Stone indent repairs

1. **Preparation:**
 - 1.1. Cut out accurately. Undercut sides of pocket where necessary to provide space for bonding material.
 - 1.2. For dressed work adjust the depth so that insert stands proud of existing stone for finishing in situ.
2. **Indents:**
 - 2.1. Ascertain the depth of the stone to be repaired.
 - 2.2. Minimum depth of new stone for indent repairs: 100mm. If the stone is less thick than 50mm or the material that would be left would be unstable, prepare for whole block replacement. If variation of the existing masonry design is necessary to provide stability seek instruction.
 - 2.3. Where shown on the drawings cut to the smallest rectangular shape necessary to replace the defective area and provide an firm seating. Install accurately and securely. Otherwise cut out to the extents of the existing mortar joints.
 - 2.4. Exposed faces - keep clear of bonding material.
3. **Existing joint widths:** Maintain. Do not bridge joints.

405 Bonded dowels

1. **Description:** To all areas required,
2. **Standard:** To BS EN 1090-1
3. **Dowels:** Austenitic stainless steel
4. **Adhesive:** Epoxy resin
5. **Holes for dowels:** Suitably sized and accurately aligned in masonry background and in rear of replacement/ insert stone; clean and dry.
6. **Other requirements:** Do not use adhesive to bond stones at joints unless instructed.

410 Corroded metal fixings

1. **Removal:** Cut out carefully, causing the least possible disturbance to surrounding masonry. Remove associated rust debris.
2. **Replacement::** Austenitic stainless steel in grade 316.
3. **Adhesive::** Epoxy resin.
4. **Requirement::** Lift copings and remove any ferrous cramps found. Otherwise remove and replace cramps where instructed.

415 Stone pinnings for rubble stonework

1. **Material for pinnings:** Reclaimed sound pinnings
2. **Placing:** Tamp pinnings firmly into fresh mortar. Ensure mortar is thoroughly compacted into voids and that levelling and load distribution functions of pinnings are retained.

Tooling/ dressing stone in situ

450 Weathering ledges at joints

1. **Locations:** Where stones project or are recessed and the ledge or pocket promotes standing or pooling water.
2. **Requirement:** Carefully weather the ledge with lime mortar as specified.

455 Descaling stone

1. **Requirement:** Carefully remove loose scaling and powdering from stones to the extent agreed.
2. **Method:** Suitable bristle brushes or carborundum blocks. Do not use wire brushes.

458 Redressing stone

1. **Requirement:** Carefully dress back stones to the extent agreed.
2. **Method:** Suitably graded carborundum blocks or tooling as appropriate.

Mortar repairs

510 Preparation for mortar repairs

1. **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.
2. **Decayed masonry:** Cut back carefully to a minimum depth of 25 mm to a sound background. Where the depth of removal exceeds 50 mm, seek instructions.
3. **Precautions:** Do not weaken masonry by removing excessive material. Do not damage adjacent masonry.
4. **Top and vertical reveals of repair area:** Undercut.
5. **Key:** Pitch face or scribe repair to provide a key.

515 Reinforcement for mortar repairs

1. **Material:** Austenitic stainless steel, phosphor bronze or copper alloy wire, 3 mm diameter.
2. **Armatures:** Form to suit profiles of mortar repair and provide effective reinforcement.
3. **Cover to reinforcement:** Not less than 18 mm.
4. **Installation:** Drill holes into background to receive reinforcement, and bond firmly with a suitable epoxy resin.

530 Proprietary mortar repairs

1. **Description:** TO MARKET CROSS BASE
2. **Mortar**
 - 2.1. **Standard:** BS EN 998-2
 - 2.2. **Manufacturer:** St Astier
 - 2.2.1. **Product reference:** St One for sandstone.
 - 2.3. **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.
 - 2.4. **Finishing coat:** To match approved samples.
 - 2.4.1. **Finished thickness:** To suit repair location.
 - 2.5. **Finish:** Felt faced float, as clause 555
3. **Reinforcement:** To manufacturers recommendations and clause 515.

540 Applying mortar

1. **Surfaces to receive mortar:** Clean, and free from dust and debris. Dampen to control suction.
2. **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.
3. 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.
4. **Finishing mortar coat:** Form accurately to required planes/ profiles, and finish flush with adjacent masonry.
5. **Protection:** Protect completed repairs from adverse weather until mortar has set.
6. **Joint:** Do not take the plastic repair across the joint. Point joint after plastic repairs have set as a separate operation.

555 Float finish to mortar repairs

1. **Procedure:** Use a wood float and/ or a felt faced float to give an even overall texture. Do not use steel floats.

Crack repairs/ ties/ reinforcement

640 Pinning

1. **Description:** TO PIN FRACTURED STONE AND FOR INDENT REPAIRS
2. **Dowels/ Pins**
 - 2.1. **Standard:** To BS EN 1090-1
 - 2.2. **Type:** Austenitic stainless steel threaded rods
 - 2.3. **Diameter:** 6 mm minimum
 - 2.4. **Additional requirements:** Penetration into background not less than 100 mm. Provisionally allow for 3 pins per stone.
3. **Resin:** Low viscosity resin to approval
4. **Holes:** Drill carefully, sloping downwards into background. Remove drilling dust and debris and keep dry.
5. **Filling holes**
 - 5.1. Check that dowel lengths are correct before filling with resin.
 - 5.2. Use sufficient resin so that when the dowel is inserted the resin is dispersed to achieve an effective repair.
6. **Exposed faces:** Keep clean and free from resin stains. Use temporary plugging material and/ or isolating membranes as necessary.
7. **Clearances:** Keep ends of ties and resin back from face of masonry.
8. **Making good after resin has cured:** Either mortar, as clause 690 or stone plugs, as clause 692

690 Making good to injection and insertion holes

1. **Preparation:** Clean out holes thoroughly.
2. **Repair mortar:** To match existing masonry units/ joints in colour and texture. Fill holes and finish mortar neatly and flush with surrounding masonry.
3. **Finished appearance:** Obtain approval for first 1 no holes before completing the remainder.

692 Making good to tie and dowel insertion holes using core drilled plugs

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

- 1.1. Plug diameter: Smallest practicable.
2. Holes: Clean.
3. Method of securing plug: Hydraulic lime for core work.
4. Joints: Fine and flush.
5. Finished appearance: Obtain approval for first 1 no. holes before completing remainder.

Grouting rubble filled cores - Not Used

Pointing/ repointing

809 Sample panels

1. Allow for providing up to 4 no different sample panels of repointing the host fabric. Allow for 600mm square for each type of pointing mix required.
2. Allow for altering the mortar mix for each sample and for each panel to dry out completely, so that the sample is representative of finished work.
3. Proceed with approved sample on receipt of architects instruction.

810 Preparation for repointing

1. Existing mortar: Working from top of wall downwards, remove mortar carefully, without damaging adjacent masonry or widening joints, to a minimum depth of twice joint thickness.
 - 1.1. Loose or friable mortar: Seek instructions when mortar beyond specified recess depth is loose or friable and/ or if cavities are found.
2. Gently work a fine hacksaw blade and / or a tungsten carbide chisel along joints and remove loose material.
3. Raked joints: Remove dust and debris.

815 Removal of hard pointing

1. Remove a sample section of hard mortar pointing in each area scheduled for removal in agreed location. Proceed upon receipt of architects instruction.
2. Carefully cut out hard mortar by picking with a chisel to reveal the original mortar joint; and /or drill fine holes along centre line of especially hard mortar joint to loosen mortar, then pick out pointing with a chisel.
3. Hammer and bolster not permitted to avoid disturbance of existing sound fabric by impact vibrations.
4. Power tools not permitted.

840 Pointing with tools/ Irons

1. General:: Begin from top of wall. Immediately before repointing flush out joints with water to remove all dust and to control suction. Wet surface until it remains wet.
2. General: Thoroughly compact mortar to fill all voids and to ensure it adheres firmly to each side of the joint. Iron mortar well into joints using appropriate pointing tools/ irons (not trowel) of width to suit the joint width, so that joints are fully filled, keeping finished mortar back from damaged and weathered arrises and to width of original joint.
3. Allow:: Allow sufficient time for the re-pointing to be done without hurry.
4. Face of masonry: Keep clear of mortar. Use suitable temporary adhesive tape on each side of joints where necessary. Finish joints neatly. Wash and brush down surface to remove light staining as soon as it occurs.

841 Deep pack pointing

1. As clause 840 but where mortar to joint is substantially lost: joint to be thoroughly filled from the back leaving no voids by building up in layers 25mm deep, layers pushed using a pointing iron.

860 Brushed finish to joints

1. **Timing:** After initial mortar set has taken place remove laitance and excess fines by brushing, to give a coarse texture. Do not compact mortar.

Ω End of Section

F20
Natural stone rubble walling

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

Structural requirements - Not Used

Types of walling

110 Rubble walling

1. **Description:** - COURSED SQUARED RUBBLE WALLING TO MATCH ADJACENT WHERE SECTIONS OF THE WALL ARE REBUILT DUE TO SETTLEMENT
2. **Stone:** To BS EN 771-6.
 - 2.1. **Name (traditional):** Re-use existing stone, ideally rebuild in stones in same location (take record photographs prior to taking down)
 - 2.2. **Supplier:** Reuse existing stone where possible. To make up for damaged stones etc take stone from client store on site and dress to size as required, with riven/fine rock face to match existing walling stone.
 - 2.3. **Size:** 100 mm on bed; random length and height
 - 2.4. **Quality:** Seasoned and free from vents, cracks, fissures or other defects deleterious to strength, durability or appearance.
3. **Mortar:** As section Z21.
 - 3.1. **Standard:** To BS EN 998-2
 - 3.2. **Mix:** 1:2-3 NHL 3.5 hydraulic lime:sand
 - 3.3. **Sand:** As Z21 320.
4. **Joints:** Flush' brushed slightly back from face for dressed stones such as quoins and kneelers; allow further brushing back for walling where stones are tooled and/or weathered.
5. **Other requirements:** Core drilling for slot drain spitter pipes.

General requirements

250 Sand samples

1. **Timing:** Before placing orders.
2. **Submit:** Representative samples for approval of colour and grading.

Laying and jointing

315 Adverse weather

1. **General:** Do not use frozen materials or lay on frozen surfaces.
2. **Air temperature:** Do not lay stones:
 - 2.1. **In cement gauged mortars:** At or below 3°C and falling or below 1°C and rising.
 - 2.2. **In hydraulic lime:sand mortars:** At or below 5°C and falling or below 3°C and rising.
3. **Temperature of walling during curing:** Above freezing until mortar hardened.
4. **Newly erected walling:** Protect at all times from:
 - 4.1. Rain and snow.
 - 4.2. Drying out too rapidly in hot conditions and in drying winds.

325 Laying generally

1. **Absorbent stones:** Dampen in warm weather to reduce suction. Do not soak.
2. **Mortar joints**
 - 2.1. **Laying:** Full bed of mortar with all joints and voids filled.
 - 2.2. **Appearance:** Neat and consistent.

3. **Orientation for natural bed of stones:** Appropriate to properties of stones and positions in walling/ dressings.
4. **Appearance and bonding:** Consistent overall appearance and good bond.
 - 4.1. **Random walling:** Distribute different shapes, sizes and colours evenly throughout the face of the wall. Avoid long continuous vertical joints.
5. **Accuracy**
 - 5.1. **Walling generally:** Plumb, unless specified otherwise.
 - 5.2. **Setting out:** Achieve satisfactory junctions and joints with adjoining or built-in elements and components.
6. **Cleanliness:** Keep facework clean. Rubbing and other abrasive or chemical cleaning methods to remove marks and stains, not permitted.

330 Walling below ground level

1. **Extent of facework below finished level of adjoining ground or external works (minimum):** 150 mm.

340 Putlog scaffolding

1. **Use:** Not permitted in facework.

360 Quoins and jambs in rubble walling

1. **Selection of stones:** Large stones, dressed to a regular shape.
2. **Laying:** In advance of main body of walling.

370 Bonders for walls faced both sides

1. **Bonding stones**
 - 1.1. **Length:** Two thirds the thickness of the wall.
 - 1.2. **Height:** Not less than one third of length.
 - 1.3. **Distribution:** One to every square metre of each side of wall and staggered.

380 Coursed work

1. **Courses:** True to line and level.

390 Brushed finish to joints

1. **General:** After the initial set has taken place, brush joints to remove laitance/ excess fines and give a coarse texture. Nominal brush back for dressed stones such as quoins and kneelers; further dressing back for more tooled and/or weathered walling stone - samples to be provided for Architect approval.

410 Support of existing works

1. **Joint above inserted lintel or masonry:** Fully consolidated with semidry mortar to support existing structure.

Ω End of Section

L30
Stairs/ ladders/ walkways/ handrails/ balustrades

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

Preliminary information/ requirements

130 Site dimensions

1. **Procedure:** Before starting work on designated items take site dimensions, record on shop drawings and use to ensure accurate fabrication.
 - 1.1. **Designated items:** Packer Spout water feature railings and Packer Spout stair flight handrails.

Components

550 Purpose-made railings

1. **Description:** Purpose-made painted galvanised mild steel railings/guard rail, fixed to stone wall surrounding Packer Spout water feature.
2. **Component material, grade and finish as delivered**
 - 2.1. **Guarding:** Painted galvanised mild steel. 40x40mm square section main post uprights, with 12mm dia. intermediate bars.
 - 2.2. **Handrails:** Painted galvanised mild steel. 75x15mm plate (with 5mm additional curve to top side). Refer drawing 3600.
 - 2.3. **Bottom rail:** Painted galvanised mild steel. 50x10mm bottom rail.
3. **Workmanship**
 - 3.1. **Metalwork:** To section Z11
4. **Fixing:** Plate welded to end of square section main posts (support posts) and fixed down to stone wall. Refer Structural Engineer's detail.

570 Purpose-made handrails

1. **Description:** Purpose-made painted galvanised mild steel handrails, with 2no. upright posts for each handrail fitted to the centre of each Packer Spout stair flight (5no. total).
2. **Component material, grade and finish as delivered**
 - 2.1. **Handrails:** Painted galvanised mild steel. 75x25mm plate (with 5mm additional curve to top side). Refer drawing 3601.
 - 2.2. **Posts:** Painted galvanised mild steel. 50x50mm square section main post uprights, 2 per handrail (1 at bottom of stair, 1 at top).
3. **Workmanship**
 - 3.1. **Metalwork:** To section Z11
4. **Fixing:** Square section posts fixed down to concrete footing. Refer Structural Engineer's detail.

Installation

620 Priming/ Sealing/ Painting

1. **Surfaces inaccessible after assembly/installation:** Before fixing components, apply full protective/decorative treatment/coating system.

630 Corrosion protection of dissimilar materials

1. **Components/ substrates/ fasteners of dissimilar materials:** Isolate using washers/ sleeves or other suitable means to separate materials to avoid corrosion and/ or staining.

640 Installation generally

1. **Fasteners and methods of fixing:** To section Z20.

2. **Structural members:** Do not modify, cut, notch or make holes in structural members, except as indicated on drawings.
3. **Temporary support:** Do not use stairs, walkways or balustrades as temporary support or strutting for other work.
4. **Applied finishes:** Substrates to be even, dry, sound and free from contaminants. Make good substrate surfaces and prepare/ prime as finish manufacturer's recommendation before application.

Completion - Not Used

Ω End of Section

M60
Painting/clear finishing

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

Coating systems

130 Paint to Existing Metalwork

1. **Description:** TO EXISTING EXTERNAL METALWORK (STAIR 8 HANDRAIL; FOUNTAIN GRILL ETC)
2. **Manufacturer:** Dulux
 - 2.1. **Product reference:** Metalshield
3. **Surfaces:** Previously decorated
 - 3.1. **Preparation:** In accordance with the manufacturers data sheet and clauses 400, 440, 500 and 521. Degrease and provide key. Ensure surfaces are clean and dry. Remove all loose and defective coatings
4. **Initial coats:** Metal primer - zinc phosphate
 - 4.1. **Number of coats:** 1
5. **Undercoats:** None.
6. **Finishing coats:** Metalshield satin RAL 7022
 - 6.1. **Number of coats:** 2

131 Paint to New Metalwork

1. **Description:** TO NEW EXTERNAL METALWORK (PACKER SPOUT STAIR FLIGHT HANDRAILS AND RAILINGS)
2. **Manufacturer:** Dulux
 - 2.1. **Product reference:** Metalshield
3. **Surfaces:** New galvanised mild steel
 - 3.1. **Preparation:** In accordance with the manufacturers data sheet and clauses 400, 440, 500 and 521. Degrease and provide key. Ensure surfaces are clean and dry.
4. **Initial coats:** Mordent solution
5. **Undercoats:** Metal primer - zinc phosphate
 - 5.1. **Number of coats:** 1
6. **Finishing coats:** Metalshield satin RAL 7022
 - 6.1. **Number of coats:** 2

Generally

215 Handling and storage

1. **Coating materials:** Deliver in sealed containers, labelled clearly with brand name, type of material and manufacturer's batch number.
2. **Materials from more than one batch:** Store separately. Allocate to distinct parts or areas of the work.

220 Compatibility

1. **Coating materials selected by contractor**
 - 1.1. Recommended by their manufacturers for the particular surface and conditions of exposure.
 - 1.2. Compatible with each other.
 - 1.3. Compatible with and not inhibiting performance of preservative/fire-retardant pretreatments.

280 Protection

1. **'Wet paint' signs and barriers:** Provide where necessary to protect other operatives and general public, and to prevent damage to freshly applied coatings.

Preparation

400 Preparation generally

1. **Standard:** In accordance with BS 6150.
2. **Refer to any pre-existing CDM Health and Safety File.**
3. **Refer to CDM Construction Phase Plan** where applicable.
4. **Suspected existing hazardous materials:** Prepare risk assessments and method statements covering operations, disposal of waste, containment and reoccupation, and obtain approval before commencing work.
5. **Preparation materials:** Types recommended by their manufacturers and the coating manufacturer for the situation and surfaces being prepared.
6. **Substrates:** Sufficiently dry in depth to suit coating.
7. **Efflorescence salts:** Remove.
8. **Dirt, grease and oil:** Remove. Give notice if contamination of surfaces/ substrates has occurred.
9. **Surface irregularities:** Remove.
10. **Joints, cracks, holes and other depressions:** Fill flush with surface, to provide smooth finish.
11. **Dust, particles and residues from preparation:** Remove and dispose of safely.
12. **Water based stoppers and fillers**
 - 12.1. Apply before priming unless recommended otherwise by manufacturer.
 - 12.2. If applied after priming: Patch prime.
13. **Oil based stoppers and fillers:** Apply after priming.
14. **Doors, opening windows and other moving parts**
 - 14.1. Ease, if necessary, before coating.
 - 14.2. Prime resulting bare areas.

440 Previously coated surfaces generally

1. **Preparation:** In accordance with BS 6150, clause 11.5.
2. **Contaminated or hazardous surfaces:** Give notice of:
 - 2.1. Coatings suspected of containing lead.
 - 2.2. Substrates suspected of containing asbestos or other hazardous materials.
 - 2.3. Significant rot, corrosion or other degradation of substrates.
3. **Suspected existing hazardous materials:** Prepare risk assessments and method statements covering operations, disposal of waste, containment and reoccupation, and obtain approval before commencing work.
4. **Removing coatings:** Do not damage substrate and adjacent surfaces or adversely affect subsequent coatings.
5. **Loose, flaking or otherwise defective areas:** Carefully remove to a firm edge.
6. **Alkali affected coatings:** Completely remove.
7. **Retained coatings**
 - 7.1. Thoroughly clean to remove dirt, grease and contaminants.
 - 7.2. Gloss-coated surfaces: Provide key.
8. **Partly removed coatings**
 - 8.1. Additional preparatory coats: Apply to restore original coating thicknesses.
 - 8.2. Junctions: Provide flush surface.
9. **Completely stripped surfaces:** Prepare as for uncoated surfaces.

490 Previously coated steel

1. Defective paintwork: Remove to leave a firm edge and clean bright metal.
2. Sound paintwork: Provide key for subsequent coats.
3. Corrosion and loose scale: Take back to bare metal.
4. Residual rust: Treat with a proprietary removal solution.
5. Bare metal: Apply primer as soon as possible.
6. Remaining areas: Degrease.

500 Preprimed steel

1. Areas of defective primer, corrosion and loose scale: Take back to bare metal. Reprime as soon as possible.

511 Galvanized, sherardized and electroplated steel

1. White rust: Remove.
2. Pretreatment: Apply one of the following:
 - 2.1. Mordant solution to blacken whole surface.
 - 2.2. Etching primer recommended by coating system manufacturer.

521 Uncoated steel – manual cleaning

1. Oil and grease: Remove.
2. Corrosion, loose scale, welding slag and spatter: Remove.
3. Residual rust: Treat with a proprietary removal solution.
4. Primer: Apply as soon as possible.

Application

711 Coating generally

1. Application standard: In accordance with BS 6150, clause 9.
2. Conditions: Maintain suitable temperature, humidity and air quality during application and drying.
3. Surfaces: Clean and dry at time of application.
4. Thinning and intermixing of coatings: Not permitted unless recommended by manufacturer.
5. Overpainting: Do not paint over intumescent strips or silicone mastics.
6. Priming coats
 - 6.1. Thickness: To suit surface porosity.
 - 6.2. Application: As soon as possible on same day as preparation is completed.
7. Finish
 - 7.1. Even, smooth and of uniform colour.
 - 7.2. Free from brush marks, sags, runs and other defects.
 - 7.3. Cut in neatly.
8. Doors, opening windows and other moving parts: Ease before coating and between coats.

Ω End of Section

Q20
Granular sub-bases to roads/ pavings

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

To be read with preliminaries/ general conditions.

110 Thicknesses of sub-base/ subgrade improvement layers

1. Thicknesses: See sections: Q25 Slab/brick/sett/cobble pavings.

120 Checking of subgrades

1. Subgrade variation: If material appears to vary from anticipated conditions, or if there are extensive soft spots, report condition and await instruction before proceeding.
2. Submit: Results and obtain instructions before proceeding.

140 Excavation of subgrades

1. Final excavation to formation or subformation level: Carry out immediately before compaction of subgrade.
2. Soft spots and voids: Give notice.
3. Old drainage and service trenches: Excavate to remove soft or damaged material, then backfill with specified granular sub-base material and compact.
4. Wet conditions: Do not excavate or compact when the subgrade may be damaged or destabilized.

145 Preparation and compaction of subgrades

1. Timing: Immediately before placing sub-base.
2. Soft or damaged areas: Excavate and replace with sub-base material, compacted in layers 300 mm (maximum) thick
3. Compaction: Thoroughly, by roller or other suitable means, adequate to resist subsidence or deformation of the subgrade during construction and of the completed roads/ pavings when in use. Take particular care to compact fully at intrusions, perimeters and where local excavation and backfilling has taken place.

210 Highways agency Type 1 unbound mixture for sub-base

1. Material: Type 1 unbound mixture to Highways Agency 'Specification for highway works', clauses 801 and 803.
 - 1.1. Recycled aggregate: Permitted

211 Granular material

1. Quality: Of a known suitability for use in sub-bases, free from excessive dust, well graded, all pieces less than 75 mm in any direction, minimum 10% fines value of 50 kN when tested in a soaked condition to BS 812-111 or a resistance to fragmentation of LA50 for the Los Angeles test to BS EN 1097-2, and in any one layer only one of the following:
 - 1.1. Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
 - 1.2. Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - 1.3. Gravel or hoggins with not more clay content than is required to bind the material together, and with no large lumps of clay.
 - 1.4. Natural gravel.
 - 1.5. Natural sand.
2. Filling: Spread and levelled in 150 mm maximum layers, each layer thoroughly compacted.

230 Placing granular material generally

1. Preparation: Loose soil, rubbish and standing water removed.
2. Structures, membranes and buried services: Ensure stability and avoid damage.

250 Laying granular sub-bases

1. **Description:** FOR PEDESTRIAN AREAS
2. **General:** Spread and levelled.
3. **Compaction**
 - 3.1. **Timing:** As soon as possible after laying.
 - 3.2. **Method:** By roller or other suitable means, adequate to resist subsidence or deformation of the sub-base during construction and of the completed paving when in use. Take particular care to compact fully at intrusions, perimeters and where local excavation and backfilling has taken place.

310 Accuracy

1. **Permissible deviation from required levels, falls and cambers (maximum)**
 - 1.1. **Subgrades**
 - 1.1.1. **Footways and recreation areas:** ± 20 mm.
 - 1.2. **Sub-bases**
 - 1.2.1. **Footways and recreation areas:** ± 12 mm

330 Cold weather working

1. **Frozen materials:** Do not use.
2. **Freezing conditions:** Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.

340 Protection

1. **Sub-bases:** As soon as practicable, cover with subsequent layers, specified elsewhere.
2. **Subgrades and sub-bases:** Prevent degradation by construction traffic, construction operations and inclement weather.

Ω End of Section

Q25
Slab/ brick/ sett/ cobble pavings

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

General - Not Used

System performance - Not Used

Products

305 Granular material for layer over existing bases

1. Material: Type 1 unbound mixture, as section Q20

310 Natural stone slabs

1. Description: TO PATHS AND STAIR LANDINGS
2. Standard: To [BS EN 1341](#).
3. Supplier: Wherever possible take up and re-bed the existing flags in their original location. Where existing flags are broken use client supply matching stone from store on site.
 - 3.1. Product reference: Natural stone flags.
4. Finish: Riven
5. Sizes: Random rectangular – variable thickness approx 65 mm
 - 5.1. Plan dimension deviation class: No requirement, but hand dress the slabs to ensure mortar joints are kept to a maximum width of say 10mm.
 - 5.2. Diagonal deviation class: No requirement
 - 5.3. Thickness deviation class: T1
6. Arrises: Roughly square, dressed by hand
7. Breaking strength: No value - flags are existing.
8. Slip resistance: No value - flags are existing.
9. Skid resistance: No value - flags are existing.
10. Surface treatment: None
11. Cleaning:: All existing flags and flags brought from store to make up areas are to be cleaned. Clean off all traces of old mortar and dirt and then clean using DOFF cleaning system. Then all flags are to be spray treated using Sapphire hard surface cleaner to remove all traces of green algal staining by spraying, to manufacturers recommendations.

311 Natural stone steps

1. Existing stone steps to be carefully lifted and sound steps to be set aside for re-bedding. Where surface of existing steps is defective, it may be possible for steps to be turned over and re-used - allow to dress to match existing finish.
2. Where repairs or replacement steps are required stone is to match existing. Where steps are replaced stone sections are to match existing.
 - 2.1. Stone colour - to match existing.
 - 2.2. Stone finish - sawn smooth to match existing.
 - 2.3. Sample - provide sample stone for repair and replacement steps for Architect approval prior to placing orders for stone.
3. Cleaning: All existing steps are to be cleaned using DOFF cleaning system and then spray treated using sapphire hard surface cleaner, spray applied, to manufacturers recommendations.

320 Tactile flags and slabs

1. Description: TO HEAD OF STEP FLIGHTS 4, 5 AND 8; BOTTOM OF STEP FLIGHTS 1 AND 6
2. Standard: To [PD CEN/TS 15209](#).
3. Material: Natural stone

3.1. Manufacturer: Contractor's choice

- 3.1.1. Product reference: Stone to match existing (flags from client store may be used if suitable) sawn smooth finish cut to leave 20mm wide x 6mm high corduroy strips with 30mm gap between strips.

4. Recycled content: Not applicable
5. Nominal sizes: Random size flags to cover minimum area shown on drawing 2011.
6. Colour: To match existing adjacent stone flags
7. Type of surface: Rib – Type R1
8. Verification:
- 8.1. Submittals: Submit sample for Client approval

365 Geotextile sheet

1. Description: BENEATH PAVING FLAGS, TO PREVENT WEED GROWTH
2. Manufacturer: Contractor's choice
- 2.1. Product reference: Non woven geotextile sheet
3. Recycled content: Submit proposals

375 Sand/ fine aggregate for site-mixed mortar

1. Description: PATHS, PAVED AREAS AROUND FOUNTAIN AND STAIR LANDINGS
2. Standard: To BS EN 12620, designations:
- 2.1. Flag and slab paving laying course: GF85 0/4 (MP)
- 2.2. Flag and slab paving jointing: GF 85 0/1 (MP). Sand to include coarse grains approx 1 / 3 of the joint width.

380 Lime for site-mixed mortar

1. Description: PATHS, PAVED AREAS AROUND FOUNTAIN AND STAIR LANDINGS - BEDDING AND POINTING
2. Standard: Natural hydraulic lime to BS EN 459-1.

490 Applied slip resistant

1. Description: Brass studs to stair nosing at head of flight
2. Manufacturer: Studmarc, Caersws, Powys
- 2.1. Product reference: Low dome anti slip brass paving stud
3. Material: Manufactured from premium brass
- 3.1. Format: Root fixed stud
- 3.2. Finish: Standard machine polished
4. Size/ Coverage: 25mm diameter x 5mm high dome. 10mm dia x 25mm deep threaded stud.
5. Colour: Brass
6. Fixing : Root fixed in epoxy resin adhesive to manufacturers recommendations
7. Spacing: 50mm gap between studs. Allow to set out say 35mm from edge of stone steps but stone mason advice should be sought to avoid weakening the edge of the stone step.

Execution

610 Material samples

1. Samples representative of colour and appearance of designated materials: Submit before placing orders.

- 1.1. Designated materials: Tactile flags; mortar pointing

620 Adverse weather

1. General
 - 1.1. Temperature: Do not lay or joint paving if the temperature is below 3°C on a falling thermometer or below 1°C on a rising thermometer.
 - 1.2. Frozen materials: Do not use. Do not lay bedding on frozen or frost covered bases.
2. Paving with mortar joints and/ or bedding
 - 2.1. Protect from frost damage, rapid drying out and saturation until mortar has hardened.

625 Laying pavings – general

1. Appearance: Smooth and even with regular joints and accurate to line, level and profile.
2. Falls: To prevent ponding. Form falls towards existing chute outlets.
3. Bedding of paving units: Firm so that rocking or subsidence does not occur or develop.
 - 3.1. Granular sub base: As clause Q25 305
 - 3.2. Bedding/ Laying course: Consistently and accurately graded, spread and compacted to produce uniform thickness and support for paving units.
4. Slopes: Lay paving units upwards from the bottom of slopes.
5. Paving units: Free of mortar and sand stains.
6. Cutting: Hand dress units cleanly and accurately, without spalling, to give neat junctions with edgings and adjoining finishes.

630 Levels of paving

1. Permissible deviation from specified levels
 - 1.1. Generally: +/-6 mm.
2. Height of finished paving above features
 - 2.1. At gullies: +6 to +10 mm.
 - 2.2. At drainage channels and kerbs: +3 to +6 mm.

635 Regularity of paved surfaces

1. Maximum variation in gap under a 3 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface)
 - 1.1. Precast concrete flags or natural stone slabs: 10 mm.
2. Difference in level between adjacent paving units (maximum): 2 mm.
3. Sudden irregularities: Not permitted.

637 Regularity of paved surfaces

1. Maximum undulations in the surface of pavings (except tactile paving surfaces) under a 1 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface): 5 mm.
2. Joints between paving units or utility access covers
 - 2.1. Joints flush with the surface: Difference in level between adjacent units to be no more than twice the joint width (with a 5 mm maximum difference in level).
 - 2.2. Recessed, filled joints: Difference in level between adjacent units to be no greater than 2 mm; the recess to be no deeper than 5 mm.
 - 2.3. Unfilled joints: Difference in level between adjacent units to be no greater than 2 mm.
3. Sudden irregularities: Not permitted.

645 Protection

1. **Cleanliness:** Keep paving clean and free from mortar droppings, oil and other materials likely to cause staining.
2. **Materials storage:** Do not overload pavings with stacks of materials.
3. **Handling:** Do not damage paving unit corners, arrises, or previously laid paving.
4. **Mortar-bedded pavings:** Keep free from traffic after laying:
 - 4.1. **Pedestrian traffic (minimum):** Seven days
5. **Access:** Restrict access to paved areas to prevent damage from site traffic and plant.

655 Condition of sub-bases/ bases before spreading laying course

1. **Trenches and excavation of soft or loose spots in subgrade:** Fill and thoroughly compact.
2. **Granular surfaces:** Lay and compact so as to be sound, clean, smooth and close-textured enough to prevent migration of bedding/ laying course materials into the sub-base during compaction and use, free from movement under compaction plant and free from compaction ridges, cracks and loose material.
3. **Prepared existing and new bound bases (roadbases):** Sound, clean, free from rutting or major cracking. Remove sharp stones, projections and debris.
4. **Sub-base/ Roadbase level tolerances:** To [BS 7533-101](#), annex A.
5. **Levels and falls:** Accurate and within the specified tolerances.
6. **Drainage outlets:** Within 0-10 mm of the required finished level.
7. **Features in unbound paving (including mortar-bedded restraints and drainage ironwork):** Complete to required levels; adequately bed and haunch in mortar.
8. **Sub-bases containing cement/ hydraulic binder:** Cure for minimum times specified in [BS 7533-4](#).

670 Laying granular layer over existing bases

1. **Thickness** 150 mm.
2. **Compaction:** Laying granular sub-bases for pedestrian areas, as section Q20
3. **Blinding:** As section Q20
4. **Excavate** as required to allow for minimum thickness of 150mm. Lay geotextile membrane over excavated surfaces. Lay 150mm clean DTp1 aggregate, well compacted, leaving little or no gaps. The sub base should be even in thickness and the finished sub base should reflect the final profile of the finished paving.

685 Laying geotextile sheet overlays

1. **Location:** Immediately below the laying course.
2. **Laying:** Fit neatly at edge restraints and other features that interrupt the laying course, e.g. drainage fittings, channels, manholes and kerbs.
3. **Edge detail:** Turn sheet up to form an upstand against features, height not less than thickness of the laying course.
4. **Width:** 1000 mm
5. **Jointing:** Lap by 300 mm.

690 Reclaimed natural stone

1. **Description:** FOR FLAGS
2. **Location/ Access:** PATHS AND STEP LANDINGS
3. **Source::** From client store on site.
4. **Lifting/ Storage/ Protection:** Stack neatly on pallets. Store in a secure compound.

5. **Preparation:** Clean using mild detergent solution. Remove all green algal staining. Remove all traces of old mortar pointing. Dress slabs to sizes to suit bonding as shown on drawings.

695 Site-mixed mortar

1. **Description:** Laying course for natural stone slab paving. Jointing for natural stone slab paving
2. **Mix:** 1:2.5 Lime (NHL5) : sand (bedding).
1:2.5 Lime (NHL5) : sand (pointing).
3. **Consistency:** Stiff plastic
4. **Admixtures:** None

714 Pointing sample

1. Provide a sample of flag pointing approx 600x600mm for Architect approval prior to commencement of flag pointing.

715 Laying flag and slab paving – mortar laying course and jointing

1. **Standard generally:** In accordance with [BS 7533-4](#).
2. **Flag installation and cutting:** Excavate as required to allow for minimum granular sub base thickness of 150mm. Lay geotextile membrane over excavated surfaces. Lay 150mm thick clean DTp1 aggregate, well compacted, leaving little or no gaps. The sub base should be even in thickness and the finished sub base should reflect the final profile of the finished paving. Apply mortar bedding layer.
Cutting - where paving is regular, to be cut cleanly and accurately, without spalling, to give neat junctions with edgings and perimeter. Where flags are irregular edged or polygonal, allow to cut edges using hand tools to leave max joint width of 10mm.
Bedding of units - firm so that rocking or subsidence does not occur or develop.
Lines and level of finished surface - as clause Q25 637.
3. **Laying course**
 - 3.1. **Nominal thickness:** 25 mm after compaction; 30 mm before laying paving slabs
4. **Joint width (nominal):** 6–10 mm

716 Relaying stone steps

1. Reset and bed steps into wall as existing. Prepare and consolidate the sub base as required.
2. **Bedding mortar for stone steps:**
 - 2.1. **Mortar** - Unilit 13/20 mortar.
 - 2.2. **Mix and apply** an even 20mm bed of Unilit 13/20 mortar to manufacturers recommendations and allow to dry out (not fully) for 2/3 days to accommodate any movement before applying the steps. nb the amount of mortar added to the mix is critical to prevent the mortar from slumping. Maximum thickness of mortar bed to be 20mm, or between 15mm to 18mm.

785 Tooled joints in mortar-bedded units

1. **Joints:** Completely filled with bedding mortar as work proceeds.
 - 1.1. **Joint width:** 6–10 mm generally. Max width in localized places 15mm
 - 1.2. **Finish:** Neat flush profile. Due to the riven flag finish allow to brush back the mortar to avoid overwide joint width.

Completion - Not Used

Ω End of Section

Z11

Purpose made metalwork

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

To be read with preliminaries/ general conditions.

310 Materials generally

1. Grades of metals, section dimensions and properties: To appropriate British Standards. When not specified, select grades and sections appropriate for the purpose.
2. Prefinished metal: May be used if methods of fabrication do not damage or alter appearance of finish, and finish is adequately protected.
3. Fasteners: To appropriate British Standards and, unless specified otherwise, of same metal as component being fastened, with matching coating or finish.

330 Steel plate, sheet and strip

1. Plates and wide flats, high yield strength steel: To BS EN 10025-6.

340 Hot rolled steel plate, sheet and strip

1. Flat products, high yield strength for cold forming: To BS EN 10149-1, -2 and -3.
2. Carbon steel sheet and strip for cold forming: To BS EN 10111.
3. Narrow strip, formable steel and steel for general engineering purposes: To BS 1449-1.8 and BS 1449-1.14.

350 Cold rolled steel plate, sheet and strip

1. Steel sections: To BS EN 10162.
2. Flat products, high yield strength micro-alloyed steels for cold forming: To BS EN 10268.
3. Carbon steel flat products for cold forming: To BS EN 10130 and BS EN 10131.
4. Uncoated carbon steel narrow strip for cold forming: To BS EN 10139 and BS EN 10140.
5. Narrow strip steel for general engineering purposes: To BS EN 10132-1, -2, and -3.
6. Carbon steel flat products for vitreous enamelling: To BS EN 10209.

360 Coated steel flat products

1. Hot dip zinc coated carbon steel sheet and strip for cold forming: To BS EN 10346 and BS EN 10143.
2. Hot dip zinc coated structural steel sheet and strip: To BS EN 10143 and BS EN 10346.
3. Hot dip zinc-aluminium (za) coated sheet and strip: To BS EN 10346.
4. Hot dip aluminium-zinc (az) coated sheet and strip: To BS EN 10346.
5. Organic coated flat products: To BS EN 10169.

370 Steel structural hollow sections (SHS)

1. Non alloy and fine grain steels, hot finished: To BS EN 10210-1 and -2.
2. Non-alloy and fine grain steels, cold formed welded: To BS EN 10219-2.
3. Weather resistant steels, hot finished: To BS 7668.

380 Other steel sections

1. Equal flange tees: To BS EN 10055.
2. Equal and unequal angles: To BS EN 10056-1 and -2.
3. Wire, carbon steel for general engineering purposes: To BS 1052.
4. Wire and wire products, general: To BS EN 10218-2.
5. Tubes
 - 5.1. Seamless circular: To BS EN 10297-1.

- 5.2. Seamless cold drawn: To BS EN 10305-1.
- 5.3. Welded and cold sized square and rectangular: To BS EN 10305-5.
- 5.4. Welded circular: To BS EN 10296-1.
- 5.5. Welded cold drawn: To BS EN 10305-2.
- 5.6. Welded cold sized: To BS EN 10305-3.

400 Stainless steel products

- 1. Chemical composition and physical properties: To BS EN 10088-1.
- 2. Sheet, strip and plate: To BS EN 10088-2.
- 3. Semi-finished products bars, rods and sections: To BS EN 10088-3.
- 4. Wire: To BS EN 1088-3.
- 5. Tubes
 - 5.1. Welded circular: To BS EN 10296-2.
 - 5.2. Seamless circular: To BS EN 10297-2.

Fabrication

515 Fabrication generally

- 1. Contact between dissimilar metals in components: Avoid.
- 2. Finished components: Rigid and free from distortion, cracks, burrs and sharp arrises.
 - 2.1. Moving parts: Free moving without binding.
- 3. Corner junctions of identical sections: Mitre.

520 Cold formed work

- 1. Profiles: Accurate, with straight arrises.

527 Welding

- 1. Description: RAILINGS AROUND FOUNTAIN AND HANDRAILS TO STAIRS FLIGHTS
- 2. Welding procedures
 - 2.1. Method and standard: Refer to engineers specification.
- 3. Preparation
 - 3.1. Joint preparation: Clean thoroughly.
 - 3.2. Surfaces of materials that will be self-finished and visible in the completed work: protect from weld splatter.
- 4. Jointing
 - 4.1. Joints: Fully bond parent and filler metal throughout with no inclusions, holes, porosity or cracks.
 - 4.2. Dissimilar metals: Not applicable
 - 4.3. Strength requirements: Welds to achieve design loads.
 - 4.4. Heat straightening: Submit proposals
 - 4.5. Complex assemblies: Agree priority for welding members to minimize distortion caused by subsequent welds.
 - 4.6. Tack welds: Use only for temporary attachment.
 - 4.7. Jigs: Provide to support and restrain members during welding.
 - 4.8. Filler plates: Submit proposals
 - 4.9. Lap joints: Minimum 5 x metal thickness or 25 mm, whichever is greater.

4.10. Weld terminations: Clean and sound.

530 Stainless steel fabrication

1. Guillotining or punching: Do not use for metal thicknesses greater than 10 mm.
2. Thermal cutting
 - 2.1. Carbonation in the heat affected zone: Remove, after cutting.
3. Bending
 - 3.1. Plates or bars: Cold bending radius not less than material thickness.
 - 3.2. Tubes: Cold bending radius not less than 2 x tube diameter.
4. Welding: In addition to general welding requirements:
 - 4.1. Protect adjacent surfaces from weld spatter.
 - 4.2. Pickle all welds before post fabrication treatments.
5. Protection: Provide protection to fabricated components during transit and on site.

Finishing

710 Finishing welded and brazed joints visible in complete work

1. Standard: To BS EN ISO 8501-3.
2. Butt joints: Smooth, and flush with adjacent surfaces.
3. Fillet joints: Neat.
4. Grinding: Grind smooth where indicated on drawings.

745 Preparation for application of coatings

1. General: Complete fabrication, and drill fixing holes before applying coatings.
2. Paint, grease, flux, rust, burrs and sharp arrises: Remove.

780 Galvanizing

1. Standard: To BS EN ISO 1461.
2. Preparation
 - 2.1. Vent and drain holes: Provide in accordance with BS EN ISO 14713-1 and -2. Seal after sections have been drained and cooled.
 - 2.2. Components subjected to cold working stresses: Heat treat to relieve stresses before galvanizing.
 - 2.3. Welding slag: Remove.
 - 2.4. Component cleaning: To BS EN ISO 8501-3.
 - 2.5. Grade: St 2½

Completion

920 Completion

1. Protection: Remove.
2. Cleaning and maintenance: Carry out in accordance with procedures detailed in fabricators' guarantees.

Ω End of Section

Z21
Mortars

Summary

Revision history

Date	No.	Title	Status	Revision	Note
18/10/2024		Broadfield Park Slopes, Rochdale	T	0	

Cement gauged mortars

100 Mortars generally

1. Mortar that is used in repair work should be of similar strength and porosity to the existing sound mortar and should never be stronger than the adjoining stonework. Provide sample panels of pointing consolidation and finish for the Architect to approve. The mortar colour for pointing consolidation works should match existing in all respects. All new mortars shall match original mortar in colour, texture and detailing.

101 Pointing and repointing

1. INTENTIONS: Cutting out and repointing will be required for one of three reasons:
2.
 1. Existing original mortar is decayed and friable, and no longer satisfies its function. In this case it will only be necessary to rake out and repoint unsound sections of the work, and power tools should never be used. If power tools are necessary to remove existing pointing it may be assumed to be sound.
3. 2. The building, or specified area, has been repointed at some time in the past with unsuitable or inappropriate mortars, such as hard cement, which is accelerating the rate of decay of the masonry. It is nevertheless, important that the work generally be carried out using hand tools in order to avoid further damage to the arises and widening of the joints.
4. 3. As part of rebuilding work.

107 Admixtures generally

1. Do not use in mortar unless specified or approved. Do not use calcium chloride or any admixtures containing calcium chloride. Admixtures, if specified, to be to BS EN 934-3 2003.

Lime:sand mortars

310 Lime:sand mortar mixes

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

320 Sand for lime:sand masonry mortars

1. **Type:** Clean, sharp, well graded, pit fresh water sand, free from loam, salts, organic matter and other impurities, to BS EN 13139: 2002.
 - 1.1. **Quality, sampling and testing:** To BS EN 13139.
 - 1.2. **Grading/ Source:** As specified elsewhere in relevant mortar mix items.
2. **Aggregate:** to match existing in colour, texture grain size and grading. If necessary source from a variety of suppliers, such as Nostrafield, Leighton Buzzard.
3. **Soft building sand:** may be added to achieve required colour or to improve workability up to 50% of total volume of sand.

336 Hydraulic lime powder

1. **Manufacturer and reference:** Singleton Birch, St Astier or equivalent.
2. **Strength:** NHL3.5 (walls, copings etc); NHL5 (flag bedding and pointing).
3. **Store in dry** as for Ordinary Portland Cement.

350 Storage of lime:sand mortar materials

1. **Sands and aggregates:** Keep different types/ grades in separate stockpiles on hard, clean, free-draining bases.

2. Ready prepared nonhydraulic lime putty: Prevent drying out and protect from frost.
3. Nonhydraulic lime:sand mortar: Store on clean bases or in clean containers that allow free drainage. Prevent drying out or wetting and protect from frost.
4. Bagged hydrated hydraulic lime: Store off the ground in dry conditions.

360 Making lime:sand mortars generally

1. **Batching:** By volume. Use clean and accurate gauge boxes or buckets.
2. **Mixing:** Mix materials thoroughly to uniform consistency, free from lumps.
3. **Contamination:** Prevent intermixing with other materials, including cement.

400 Making hydraulic lime:sand mortars

1. **Mixing hydrated hydraulic lime:sand:** Follow the lime manufacturer's recommendations for each stage of the mix.
 - 1.1. **Water quantity:** Only sufficient to produce a workable mix.
2. **Working time:** Within limits recommended by the hydraulic lime manufacturer.

500 Mortar samples

1. Provide up to 5 no. biscuit mortar samples for each type of mortar mix required. The appropriate mortar samples will be subject to dried mortar samples on the basis of broken biscuit sample and to wall samples showing the complete finish/joint treatment. Notify the Architect of the mix components of all samples.
2. Give 1 week notice for the availability of mortar samples for inspection and allow a further 2 weeks in the programme for any tweaking of the samples and obtain approval via Architects Instruction.

510 Protection

1. Tend to all freshly laid mortars to ensure slow proper and complete curing. Follow the guidelines for adverse weather in section F21.
2. Protection materials: hessian, dampened down if necessary to help control evaporation of moisture in the mortar. Mist spray mortar if necessary to ensure continuous drying, curing and carbonation.

Ω End of Section



Specification created using NBS Chorus