

Manchester City Council

Aids and Adaptations

Hardstanding

29-06-2022

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C20 Demolition

General requirements

110 Desk study/ Survey

1. **Scope:** Before starting deconstruction/ demolition work, examine available information, and carry out a survey of:
 - 1.1. the structure or structures to be deconstructed/ demolished,
 - 1.2. the site on which the structure or structures stand, and
 - 1.3. the surrounding area.
2. **Report and method statements:** Submit, describing:
 - 2.1. Form, condition and details of the structure or structures, the site, and the surrounding area.
 - 2.1.1. **Extent:** As drawing
 - 2.2. Type, location and condition of features of historical, archaeological, geological or ecological importance.
 - 2.3. Type, location and condition of adjoining or surrounding premises that might be adversely affected by removal of the structure or structures, or by noise, vibration and/ or dust generated during deconstruction/ demolition.
 - 2.4. Identity and location of services above and below ground, including those required for the Contractor's use, and arrangements for their disconnection and removal.
 - 2.5. Form and location of flammable, toxic or hazardous materials, including lead-based paint, and proposed methods for their removal and disposal.
 - 2.6. Form and location of materials identified for reuse or recycling, and proposed methods for removal and temporary storage.
 - 2.7. Proposed programme of work, including sequence and methods of deconstruction/ demolition.
 - 2.8. Details of specific pre-weakening required.
 - 2.9. Arrangements for protection of personnel and the general public, including exclusion of unauthorized persons.
 - 2.10. Arrangements for control of site transport and traffic.
 - 2.11. **Special requirements:** as per Contract Administrators instruction

120 Extent of deconstruction/ demolition

1. General: Subject to retention requirements specified elsewhere, deconstruct/ demolish structures down to levels as shown on drawing.

130 Groundworks

1. **Old foundations, slabs and the like:** Break out in locations and to the extents stated.
2. **Contaminated material:** Remove, and carry out remediation required by the Enforcing Authority.

140 Bench marks

1. **Unrecorded bench marks and other survey information:** Give notice when found. Do not remove marks or destroy the fabric on which they are found.

150 Features to be retained

1. General: Keep in place and protect the following: As per Schedule/Drawing and/or Contract Administrators Instruction .

Services affected by deconstruction/ demolition

210 Services regulations

1. **Work carried out to or affecting new and/ or existing services:** Carry out in accordance with the byelaws and/ or regulations of the relevant Statutory Authority.

220 Location 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 National Joint Utilities Group 'Guidelines on the positioning and colour coding of underground utilities' apparatus'.

230 Services disconnection arranged by contractor

1. **General:** Arrange with the appropriate authorities for disconnection of services and removal of fittings and equipment owned by those authorities prior to starting deconstruction/ demolition.

240 Disconnection of drains

1. **General:** Locate, disconnect and seal disused foul and surface water drains.
2. **Sealing:** Permanent, and within the site.

250 Live foul and surface water drains

1. **Drains and associated manholes, inspection chambers, gullies, vent pipes and fittings**
 - 1.1. Protect; maintain normal flow during deconstruction/ demolition.
 - 1.2. Make good any damage arising from deconstruction/ demolition work.
 - 1.3. Leave clean and in working order at completion of deconstruction/ demolition work.

260 Service bypass connections

1. **General:** Provide as necessary to maintain continuity of services to occupied areas of the site on which the deconstruction/ demolition is taking place and to adjoining sites/ properties.
2. **Minimum notice to adjoining owners and all affected occupiers:** 72 hours, if shutdown is necessary during changeover.

270 Services to be retained

1. **Damage to services:** Give notice, and notify relevant service authorities and/ or owner/ occupier regarding damage arising from deconstruction/ demolition.
2. **Repairs to services:** Complete as directed, and to the satisfaction of the service authority or owner.

Deconstruction/ demolition work

310 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 CITB Certificates of Competence.
3. **Site staff responsible for supervision and control of work:** Experienced in the assessment of risks involved and methods of deconstruction/ demolition to be used.

320 Gas or vapour risks

1. **Precautions:** Prevent fire and/ or explosion caused by gas and/ or vapour from tanks, pipes, etc.

330 Dust control

1. **General:** Reduce airborne dust by periodically spraying deconstruction/ demolition works with an appropriate wetting agent. Keep public roadways and footpaths clear of mud and debris.
2. **Lead dust:** Submit method statement for control, containment and clean-up regimes.

340 Health hazards

1. **Precautions:** Protect site operatives and general public from hazards associated with vibration, dangerous fumes and dust arising during the course of the Works.

350 Adjoining property

1. **Temporary support and protection:** Provide. Maintain and alter, as necessary, as work proceeds. Do not leave unnecessary or unstable projections.
2. **Defects:** Report immediately on discovery.
3. **Damage:** Minimize. Repair promptly to ensure safety, stability, weather protection and security.
4. **Support to foundations:** Do not disturb.

360 Structures to be retained

1. **Extent:** As drawing/Schedule
2. **Parts which are to be kept in place:** Protect.
3. **Interface between retained structures and deconstruction/ demolition:** Cut away and strip out with care to minimize making good.

370 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.

380 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.

390 Asbestos-containing materials – known occurrences

1. **General:** Materials containing asbestos are known to be present in: Refer to Asbestos Report.
2. **Removal:** By contractor licensed by the Health and Safety Executive, and prior to other works starting in these locations

390 Asbestos-containing materials – known occurrences Type A

1. **General:** Materials containing asbestos are known to be present in: Refer to Asbestos Report.
2. **Removal:** By non-licensed contractor following statutory risk assessment

391 Asbestos-containing materials – unknown occurrences

1. **Discovery:** Give notice immediately of suspected asbestos-containing materials when discovered during deconstruction/ demolition work. Avoid disturbing such materials.

2. **Removal:** Submit statutory risk assessments and details of proposed methods for safe removal.

410 Unforeseen hazards

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

420 Open basements, etc

1. **Temporary support:** Leave adequate buttress walls or provide temporary support to basement retaining walls up to ground level.
2. **Safety:** Make remaining sections of retaining and buttress walls safe and secure.
3. **Water movement:** Make holes in basement floors to allow water drainage or penetration (depending on water table). Provide a hole for every 10 m², not less than 600 mm in diameter.

430 Filling of basements, etc

1. **Temporary support:** Leave adequate buttress walls or provide temporary support to basement retaining walls up to ground level.
2. **Water movement:** Make holes in basement floors to allow water drainage or penetration (depending on water table). Provide a hole for every 10 m², not less than 600 mm in diameter.
3. **Filling:** Remove organic material and soil from basements and other voids. Fill and consolidate with granular material in accordance with local Highway Authority requirements.

442 Site surface at completion

1. **Levels:** Grade the site to follow the levels of adjacent areas.

450 Site condition at completion

1. **Debris:** Clear away and leave the site in a tidy condition.
2. **Other requirements:** as per Contract Administrators instruction

Materials arising

510 Contractor's property

1. **Components and materials arising from the deconstruction/ demolition work:** Property of the Contractor except where otherwise provided.
2. **Action:** Remove from site as work proceeds where not to be reused or recycled for site use.

511 Employer's property

1. **Components and materials to remain the property of the Employer:** at Contract Administrators discretion
2. **Protection:** Maintain until these items are removed by the Employer or reused in the Works, or until the end of the Contract.

520 Recycled materials

1. **Materials arising from deconstruction/ 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

D20

Excavating and filling

Generally/the site

110 Site investigation

1. **Report:** The report should give details and locations of trial pits or boreholes, including soils and strata details and groundwater levels.

145 Variations in ground water level

1. **Give notice:** If levels encountered are significantly different from levels in the site investigation report or previously measured.

150 Existing services, features and structures

1. **Services:** See section A12 for locations.
2. **Site features to be retained:** See section A12 for details.
3. **Structures:** See section A34 for details of protection.

Clearance/excavating

168 Site clearance

1. **Timing:** Before topsoil stripping, if any.
2. **General:** Clear site of rubbish, debris and vegetation. Do not compact topsoil.
3. **Treatment:** Apply a suitable non-residual herbicide to areas to receive planting

170 Removing small trees, shrubs, hedges and roots

1. **Identification:** Clearly mark trees to be removed.
2. **Small trees, shrubs and hedges:** Cut down.
3. **Roots:** Grub up and dispose of without undue disturbance of soil and adjacent areas.
4. **Safety:** Comply with Forest Industry Safety Accord safety leaflets.

220 Stripping topsoil

1. **General:** Before beginning general excavation or filling, strip topsoil from areas where there will be regrading, buildings, pavings/ roads and other areas shown on drawings.
2. **Depth**
 - 2.1. Remove to an average depth of 150 mm.
 - 2.2. Give notice where the depth of topsoil is difficult to determine.
3. **Handling:** Handle topsoil for reuse or sale in accordance with clause 225.
4. **Around trees:** Do not remove topsoil from below the spread of trees to be retained.
5. **Site storage:** Not required

221 Treating topsoil

1. **Treatment:** Apply a suitable translocated nonresidual herbicide.
2. **Timing:** Not less than two weeks before excavating topsoil.

225 Handling topsoil

1. **Standard:** To BS 3882.

2. **Aggressive weeds**
 - 2.1. **Species:** Notify the presence of species included in the Weeds Act, section 2, or the appropriate Wildlife and Countryside Act for the relevant jurisdiction.
 - 2.2. **Give notice:** Obtain instructions before moving topsoil.
3. **Contamination:** Do not mix topsoil with:
 - 3.1. Subsoil, stone, hardcore, rubbish or material from demolition work.
 - 3.2. Other soil or material containing aggressive weeds, sharps, plastics and non soil forming materials and notifiable animal or plant diseases.
 - 3.3. Oil, fuel, cement or other substances harmful to plant growth.
 - 3.4. Other classifications of topsoil.
4. **Multiple handling:** Keep to a minimum. Use topsoil immediately after stripping.

244 Excavations adjacent to existing foundations

1. **Prior to commencing excavation**
 - 1.1. Excavate trial pits adjacent to existing foundations to determine extent and formation levels.
 - 1.2. Allow for inspection of trial pits.
 - 1.3. Allow time for amendment of details if required.
 - 1.3.1. **Time period:** 10 working days
2. **Backfill material to new excavation:** to be confirmed by Contract Administrator

246 Excavations adjacent to pile supported structures

1. **Proximity:** When the formation level of an excavation will be lower than the pile cut off level and the distance between the near faces of the pile cap/ ground beam and the excavation is less than the difference in depth between the pile cap and the excavation formations.
 - 1.1. Delay the adjacent excavation until three days after casting the pile cap/ ground beam.

250 Permissible deviations from formation levels

1. **Beneath mass concrete foundations:** ± 25 mm.
2. **Beneath ground bearing slabs and r.c. foundations:** ± 15 mm.
3. **Embankments and cuttings:** ± 50 mm.
4. **Ground abutting external walls:** ± 50 mm, but such as to ensure that finished level is not less than 150 mm below dpc.

270 Foundations generally

1. **Give notice if**
 - 1.1. A natural bearing formation of undisturbed subsoil is not obtained at the depth shown on the drawings.
 - 1.2. The formation contains soft or hard spots or highly variable material.

290 Foundations in made up ground

1. **Depth:** Excavate down to a natural formation of undisturbed subsoil.
2. **Discrepancy:** Give notice if this is greater or less than depth given.

310 Unstable ground

1. **Generally:** Ensure that the excavation remains stable at all times.
2. **Give notice:** Without delay if any newly excavated faces are too unstable to allow earthwork support to be inserted.

3. **Take action:** If instability is likely to affect adjacent structures or roadways, take appropriate emergency action.

330 Unrecorded features

1. **Give notice:** If unrecorded foundations, beds, voids, basements, filling, tanks, pipes, cables, drains, manholes, watercourses, ditches, etc. not shown on the drawings are encountered.

350 Existing watercourses

1. **Diverted watercourses which are to be filled:** Before filling, remove vegetable growths and soft deposits.

Disposal of materials

415 Excavated topsoil removal

1. **General:** Remove from site.

450 Water

1. **Generally:** Keep all excavations free from water until:
 - 1.1. Formations are covered.
 - 1.2. Below ground constructions are completed.
2. **Drainage:** Form surfaces of excavations and fill to provide adequate falls.
3. **Removal of water:** Provide temporary drains, sumps and pumping as necessary. Do not pollute watercourses with silt laden water.

454 Ground water level, springs or running water

1. **Give notice:** If it is considered that the excavations are below the water table.
2. **Springs/ Running water:** Give notice immediately if encountered.

Filling

500 Proposed fill materials

1. **Details:** Submit full details of proposed fill materials to demonstrate compliance with specification, including:
 - 1.1. Type and source of imported fill.
 - 1.2. Proposals for processing and reuse of material excavated on site.
 - 1.3. Test reports as required elsewhere.

510 Hazardous, aggressive or unstable materials

1. **General:** Do not use fill materials which would, either in themselves or in combination with other materials or ground water, give rise to a health hazard, damage to building structures or instability in the filling, including material that is:
 - 1.1. Frozen or containing ice.
 - 1.2. Organic.
 - 1.3. Contaminated or noxious.
 - 1.4. Susceptible to spontaneous combustion.
 - 1.5. Likely to erode or decay and cause voids.
 - 1.6. With excessive moisture content, slurry, mud or from marshes or bogs.
 - 1.7. Clay of liquid limit exceeding 80 and/or plasticity index exceeding 55.
 - 1.8. Unacceptable, class U2 as defined in the 'Specification for highway works', clause 601.

520 Frost susceptibility

1. **General:** Except as allowed below, fill must be non frost-susceptible as defined in the 'Specification for highway works', clause 801.8.
2. **Test reports:** If the following fill materials are proposed, submit a laboratory report confirming they are non frost- susceptible:
 - 2.1. Fine grained soil with a plasticity index less than 20%.
 - 2.2. Coarse grained soil or crushed granite with more than 10% retained on a 0.063 mm sieve.
 - 2.3. Crushed chalk.
 - 2.4. Crushed limestone fill with average saturation moisture content in excess of 3%.
 - 2.5. Burnt colliery shale.
3. **Frost-susceptible fill:** May only be used:
 - 3.1. Within the external walls of buildings below spaces that will be heated. Protect from frost during construction.
 - 3.2. Where frost heave will not affect structural elements.

530 Placing fill

1. **Surfaces of excavations and areas to be filled:** Free from loose soil, topsoil, organic material, rubbish and standing water.
2. **Freezing conditions:** Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.
3. **Adjacent structures, membranes and buried services**
 - 3.1. Do not overload, destabilise or damage.
 - 3.2. Submit proposals for temporary support necessary to ensure stability during filling.
 - 3.3. Allow 14 days (minimum) before backfilling against in situ concrete structures.
4. **Layers:** Place so that only one type of material occurs in each layer.
5. **Earthmoving equipment:** Vary route to avoid rutting.

535 Compaction generally

1. **General:** Compact fill not specified to be left loose as soon as possible after placing.
2. **After compaction:** Surface of each layer must be well closed, showing no movement under compaction plant, and without cracks, holes, ridges, loose material and the like.
3. **Defective areas:** Remove and recompact to full thickness of layer using new material.

710 Hardcore filling

1. **Fill:** Granular material, free from harmful matter and excessive dust, well graded, all pieces less than 75 mm in any direction:
2. **Material**
 - 2.1. **Permitted materials in any one layer**
 - 2.1.1. Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
 - 2.1.2. Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - 2.1.3. Crushed non-expansive slag.
 - 2.1.4. Gravel or hoggins with not more clay content than is required to bind the material together, and with no large lumps of clay.
 - 2.1.5. Well-burned non-plastic colliery shale.
 - 2.1.6. Natural gravel.
 - 2.1.7. Natural sand.

3. **Filling:** Spread and level in 150 mm maximum layers. Thoroughly compact each layer.

715 Venting hardcore layer

1. **Fill:** Clean granular material, well graded, passing a 75 mm BS sieve but retained on a 20 mm BS sieve. In each layer only one of the following:
 - 1.1. Crushed hard rock.
 - 1.2. Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - 1.3. Gravel.
2. **Filling:** Spread and level in 150 mm maximum layers. Thoroughly compact each layer whilst maintaining enough voids to allow efficient venting.

730 Blinding

1. Surfaces to receive sheet overlays or concrete:
2. Blind with
 - 2.1. Concrete where shown on drawings; or
3. Sand, fine gravel, or other approved fine material applied to fill interstices. Moisten as necessary before final rolling to provide a flat, closed, smooth surface.
4. Sand for blinding: To BS EN 12620, grade 0/4 or 0/2 (MP).
5. Permissible deviations on surface level: +0/-25mm

Bioremediation - Not Used

'specification for highway works: earthworks specification' appendices - Not Used

Ω End of Section

E10

Mixing/casting/curing in situ concrete

Concrete

101 Specification

1. Concrete generally: To BS 8500-2.
2. Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.

105 Designated concrete

1. Description: As required
2. Designation: Submit proposals
3. Fibres: Not required
4. Aggregates
 - 4.1. Size (maximum): 20 mm
 - 4.2. Coarse recycled aggregates: Contractor's choice
 - 4.3. Additional aggregate requirements: None
5. Special requirements for cement/ combinations: None
6. Consistence class: Contractor's choice
7. Chloride class: Normal
8. Admixtures: Concrete producer's choice
9. Additional mix requirements: None

125 Substitution of standardized prescribed concrete for designated concrete

1. General: Conform to BS 8500-2, clause 9.
2. Substitution: In accordance with BS 8500-1, Table A.14.
 - 2.1. Proposals: Submit for each substitution, stating reasons.
3. Site mixing: Permitted as clause 218

Materials, batching and mixing

215 Ready-mixed concrete

1. Production plant: Currently certified by a body accredited by UKAS to BS EN ISO/IEC 17065 for product conformity certification of ready-mixed concrete .
2. Source of ready-mixed concrete: Obtain from one source if possible . Otherwise, submit proposals .
 - 2.1. Name and address of depot: Submit before any concrete is delivered .
 - 2.2. Delivery notes: Retain for inspection .
3. Declarations of nonconformity from concrete producer: Notify immediately .

218 Site mixed concrete

1. Batching by mass
 - 1.1. Accuracy of measuring devices: To BS EN 206, clause 9.6.2.2.
 - 1.1.1. Tolerances for quantity of constituent material: To BS EN 206, Table 27.
2. Batching by volume

- 2.1. **Restrictions:** None for mix ST1. Otherwise maximum pour size of 05.m3
3. **Mixing:** To BS 8000-2.1, subsections 2, 3 and 4.

221 Information about proposed concretes

1. **Submit when requested**
 - 1.1. Details listed in BS 8500-1, clause 5.2.

230 Interruption of supply during concreting

1. **Elements without joints:** Where elements are detailed to be cast in a single pour without joints, make prior arrangements for a back-up supply of concrete.
2. **Elsewhere**
 - 2.1. **Preparation:** Manage pour to have a full face, and have materials available to form an emergency construction joint while concrete can still be worked.
 - 2.2. **Before pour is completed:** Submit location and details of joint, make proposals for joint preparation.

490 Properties of fresh concrete

1. **Adjustments to suit construction process:** Determine with concrete producer . Maintain conformity to the specification .

Project testing/ certification - Not Used

Placing/ compacting/ curing and protecting

620 Temperature of concrete

1. **Application:** as required
2. **Objective:** Limit maximum temperature of concrete to minimize cracking during placing, compaction and curing. Take account of:
 - 2.1. **High temperatures and steep temperature gradients:** Prevent build-up during first 24 hours after casting. Prevent coincidence of maximum heat gain from cement hydration with high air temperature and/ or solar gain.
 - 2.2. **Rapid changes in temperature:** Prevent during the first seven days after casting.
3. **Proposals for meeting objective:** Submit.

630 Premature water loss

1. **Requirement:** Prevent water loss from concrete laid on absorbent substrates .
 - 1.1. **Underlay:** Select from:
 - 1.1.1. Polyethylene sheet: 250 micrometres thick .
 - 1.1.2. Building paper: To BS 1521, grade B1F .
 - 1.2. **Installation:** Lap edges 150 mm .

648 Adverse temperature conditions

1. **Requirement:** Submit proposals for protecting concrete when predicted ambient temperatures indicate risk of concrete freezing or overheating.

650 Surfaces to receive concrete

1. **Cleanliness of surfaces immediately before placing concrete:** Clean with no debris, tying wire clippings, fastenings or free water .

670 Transporting

1. **General:** Avoid contamination, segregation, loss of ingredients, excessive evaporation and loss of workability . Protect from heavy rain .
2. **Entrained air:** Anticipate effects of transport and placing methods in order to achieve specified air content .

680 Placing

1. **Records:** Maintain for time, date and location of all pours.
2. **Timing:** Place as soon as practicable after mixing and while sufficiently plastic for full compaction.
3. **Temperature limitations for concrete:** 30°C (maximum) and 5°C (minimum), unless otherwise specified. Do not place against frozen or frost covered surfaces.
4. **Continuity of pours:** Place in final position in one continuous operation up to construction joints. Avoid formation of cold joints.
5. **Discharging concrete:** Prevent uneven dispersal, segregation or loss of ingredients or any adverse effect on the formwork or formed finishes.
6. **Thickness of layers:** To suit methods of compaction and achieve efficient amalgamation during compaction.
7. **Poker vibrators:** Do not use to make concrete flow horizontally into position, except where necessary to achieve full compaction under void formers and cast-in accessories and at vertical joints.

690 Compacting

1. **General:** Fully compact concrete to full depth to remove entrapped air. Continue until air bubbles cease to appear on the top surface.
 - 1.1. **Areas for particular attention:** Around reinforcement, under void formers, cast-in accessories, into corners of formwork and at joints.
2. **Consecutive batches of concrete:** Amalgamate without damaging adjacent partly hardened concrete.
3. **Methods of compaction:** To suit consistence class and use of concrete.

720 Vibrators

1. **General:** Maintain sufficient numbers and types of vibrator to suit pouring rate, consistency and location of concrete .
2. **External vibrators:** Obtain approval for use .

730 Plastic settlement

1. **Settlement cracking:** Inspect fresh concrete closely and continuously wherever cracking is likely to occur, including the top of deep sections and at significant changes in the depth of concrete sections .
 - 1.1. **Timing:** During the first few hours after placing and whilst concrete is still capable of being fluidized by the vibrator .
2. **Removal of cracks:** Revibrate concrete.

810 Curing generally

1. **Requirement:** Keep surface layers of concrete moist throughout curing period, including perimeters and abutments, by either restricting evaporation or continuously wetting surfaces of concrete.
 - 1.1. **Surfaces covered by formwork:** Retain formwork in position and, where necessary to satisfy curing period, cover surfaces immediately after striking.

- 1.2. **Top surfaces:** Cover immediately after placing and compacting. If covering is removed for finishing operations, replace it immediately afterwards.
2. **Surface temperature:** Maintain above 5°C throughout the specified curing period or four days, whichever is longer.
3. **Records:** Maintain details of location and timing of casting of individual batches, removal of formwork and removal of coverings. Keep records on site, available for inspection.

811 Coverings for curing

1. **Sheet coverings:** Suitable impervious material .
2. **Curing compounds:** Selection criteria:
 - 2.1. **Curing efficiency:** Not less than 75% or for surfaces exposed to abrasion 90% .
 - 2.2. **Colouring:** Fugitive dye .
 - 2.3. **Application to concrete exposed in the finished work:** Readily removable without disfiguring the surface .
 - 2.4. **Application to concrete to receive bonded construction/ finish:** No impediment to subsequent bonding .
3. **Interim covering to top surfaces of concrete:** Until surfaces are in a suitable state to receive coverings in direct contact, cover with impervious sheeting held clear of the surface and sealed against draughts at perimeters and junctions .

812 Preventing early age thermal cracking

1. **Deep lifts or large volume pours:** Submit proposals for curing to prevent early age thermal cracking, taking account of:
 - 1.1. Temperature differentials across sections .
 - 1.2. Coefficient of thermal expansion of the concrete .
 - 1.3. Strain capacity of the concrete mix (aggregate dependent) .
 - 1.4. Restraint .

818 Curing periods generally

1. **Minimum periods:** When not otherwise indicated, to BS EN 13670, Annex F.8.5.

840 Protection

1. **Prevent damage to concrete, including**
 - 1.1. **Surfaces generally:** From rain, indentation and other physical damage .
 - 1.2. **Surfaces to exposed visual concrete:** From dirt, staining, rust marks and other disfiguration .
 - 1.3. **Immature concrete:** From thermal shock, physical shock, overloading, movement and vibration .
 - 1.4. **In cold weather:** From entrapment and freezing expansion of water in pockets, etc .

Ω End of Section

E41

Worked finishes to in situ concrete

To be read with preliminaries/ general conditions.

150 Finishing

1. Timing: Carry out at optimum times in relation to setting and hardening of concrete.
2. Prohibited treatments to concrete surfaces
 - 2.1. Wetting to assist surface working.
 - 2.2. Sprinkling cement.

240 Wood floated finish

1. Surface on completion: Slightly coarse, even texture with no ridges or steps.

310 Smooth floated finish

1. Surface on completion: Even with no ridges or steps.

320 Trowelled finish

1. Surface on completion: Uniform, smooth but not polished, free from trowel marks and blemishes, and suitable to receive specified flooring material.

330 Trowelled finish for wearing surfaces

1. Surface on completion: Uniform and smooth, free from trowel marks and blemishes.

Ω End of Section

F10 Brick/ block walling

Types of walling

385 Engineering brickwork

1. Description: IN MANHOLES
2. Bricks: To BS EN 771-1.
 - 2.1. Manufacturer: Contractor's choice
 - 2.1.1. Product reference: Contractor's choice
 - 2.2. Mean compressive strength: Greater than or equal to 75 N/mm²
 - 2.2.1. Category: I
 - 2.3. Water absorption: Equal to or less than 4.5%
 - 2.4. Freeze/ thaw category: F2.
 - 2.5. Active soluble salts content category: S2.
 - 2.6. Additional requirements: None
3. Mortar: As section Z21.
 - 3.1. Standard: To BS EN 998-2
 - 3.2. Mix: Site-batched and mixed mortar: Select from: 1:¼:3 cement:lime:sand 1:½:4½ cement:lime:sand
 - 3.3. Additional requirements: None
4. Bond: To match existing
5. Joints: Flush.

Testing - Not Used

Workmanship generally

460 Mortar designations

1. Mix proportions: For a specified designation select a mix from the following:
 - 1.1. Designation (i) (BS EN 998-2 M12 equivalent)
 - 1.1.1. 1:0-¼:3 (Portland cement:lime:sand with or without air entraining additive).
 - 1.1.2. 1:3 (Portland cement:sand and air entraining additive).
 - 1.2. Designation (ii) (BS EN 998-2 class M6 equivalent)
 - 1.2.1. 1:½:4-5 (Portland cement:lime:sand with or without air entraining additive).
 - 1.2.2. 1:3 (masonry cement:sand containing Portland cement and lime in approximate ratio 1:1, and an air entraining additive).
 - 1.2.3. 1:2½-3½ (masonry cement:sand containing Portland cement and inorganic materials other than lime and air entraining additive).
 - 1.2.4. 1:3-4 (Portland cement:sand and air entraining additive).
 - 1.3. Designation (iii) (BS EN 998-2 class M4 equivalent)
 - 1.3.1. 1:1:5-6 (Portland cement:lime:sand with or without air entraining additive).
 - 1.3.2. 1:3½-4 (masonry cement:sand containing Portland cement and lime in approximate ratio 1:1, and an air entraining additive).
 - 1.3.3. 1:4-5 (masonry cement:sand containing Portland cement and inorganic materials other than lime and air entraining additive).
 - 1.3.4. 1:5-6 (Portland cement:sand and air entraining additive).

- 1.4. Designation (iv) (BS EN 998-2 class M2 equivalent)
 - 1.4.1.1:2:8-9 (Portland cement:lime:sand with or without air entraining additive).
 - 1.4.2.1:4½ (masonry cement:sand containing Portland cement and lime in approximate ratio 1:1, and an air entraining additive).
 - 1.4.3.1:5½-6½ (masonry cement:sand containing Portland cement and inorganic materials other than lime and air entraining additive).
 - 1.4.4.1:7-8 (Portland cement:sand and air entraining additive).
2. Batching: Mix proportions by volume.
3. Mortar type: Continuous throughout any one type of masonry work.

500 Laying generally

1. Mortar joints: Fill vertical joints. Lay bricks, solid and cellular blocks on a full bed.
2. AAC block thin mortar adhesive and gypsum block adhesive joints: Fill vertical joints. Lay blocks on a full bed.
3. Clay block joints
 - 3.1. Thin-layer mortar: Lay blocks on a full bed.
 - 3.2. Interlocking perpend: Butted.
4. Bond where not specified: Half-lap stretcher.
5. Vertical joints in brick and concrete block facework: Even widths. Plumb at every fifth cross joint.

520 Accuracy

1. Courses: Level and true to line.
2. Faces, angles and features: Plumb.
3. Permissible deviations
 - 3.1. Position in plan of any point in relation to the specified building reference line and/ or point at the same level: ± 10 mm.
 - 3.2. Straightness in any 5 m length: ± 5 mm.
 - 3.3. Verticality up to 3 m height: ± 10 mm.
 - 3.4. Verticality up to 7 m height: ± 14 mm.
 - 3.5. Overall thickness of walls: ± 10 mm.
 - 3.6. Level of bed joints up to 5 m (brick masonry): ± 11 mm.
 - 3.7. Level of bed joints up to 5 m (block masonry): ± 13 mm.

535 Height of lifts in walling using cement-gauged or hydraulic lime mortar

1. Quoins and advance work: Rack back.
2. Lift height (maximum): 1.2 m above any other part of work at any time.
3. Daily lift height (maximum): 1.5 m for any one leaf.

540 Height of lifts in walling using thin-layer mortar

1. Quoins and advance work: Rack back.
2. Lift height (maximum): 1.3 m above any other part of work at any time.

545 Levelling of separate leaves

1. Locations for equal levelling of cavity wall leaves: As follows:
 - 1.1. Every course containing vertical twist type ties or other rigid ties.
 - 1.2. Every third tie course for double triangle/ butterfly ties.

- 1.3. Courses in which lintels are to be bedded.

560 Coursing brickwork

1. Gauge: Four brick courses including bed joints to 300 mm.

561 Coursing brickwork with existing

1. Gauge: Line up with existing brick courses.

580 Laying frogged bricks

1. Single frogged bricks: Frog uppermost.
2. Double frogged bricks: Larger frog uppermost.
3. Frog cavity: Fill with mortar.

595 Lintels

1. Bearing: Ensure full length masonry units occur immediately under lintel ends.

610 Support of existing work

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

620 Block bonding new walls to existing

1. Pocket requirements: Formed as follows:
 - 1.1. Width: Full thickness of new wall.
 - 1.2. Depth (minimum): 100 mm.
 - 1.3. Vertical spacing
 - 1.3.1. Brick to brick: 4 courses high at 8 course centres.
 - 1.3.2. Block to block: Every other course.
2. Pocket joints: Fully filled with mortar.

635 Jointing

1. Profile: Consistent in appearance.

645 Accessible joints not exposed to view

1. Jointing: Struck flush as work proceeds.

690 Adverse weather

1. General: Do not use frozen materials or lay on frozen surfaces.
2. Air temperature requirements: Do not lay bricks/ blocks:
 - 2.1. In cement-gauged mortars when at or below 3°C and falling or unless it is at least 1°C and rising.
 - 2.2. In hydraulic lime:sand mortars when at or below 5°C and falling or below 3°C and rising, or as manufacturer's/ supplier's recommendations.
 - 2.3. In thin-layer mortars when outside the limits set by the mortar manufacturer.
3. Temperature of walling during curing: Above freezing until 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.

Additional requirements for facework

710 The term facework

1. Definition: Applicable in this specification to brick/ block walling finished fair.
 - 1.1. Painted facework: The only requirement to be waived is that relating to colour.

730 Brick/ Concrete block samples

1. Selection of samples: Representative of the range in variation of appearance.

750 Colour consistency of masonry units

1. Colour range: Submit proposals of methods taken to ensure that units are of consistent and even appearance within deliveries.
2. Conformity: Check each delivery for consistency of appearance with previous deliveries and with approved reference panels; do not use if variation is excessive.
3. Facing bricks should be blended on site from a minimum of three packs to ensure an even distribution of colour and texture variation.
4. Finished work: Free from patches, horizontal stripes and racking back marks.

760 Appearance

1. Brick/ block selection: Do not use units with damaged faces or arrises.
2. Cut masonry units: Where cut faces or edges are exposed cut with table masonry saw.
3. Quality control: Lay masonry units to match relevant reference panels.
 - 3.1. Setting out: To produce satisfactory junctions and joints with built-in features and components.
 - 3.2. Coursing: Evenly spaced using gauge rods.
4. Lifts: Complete in one operation.
5. Methods of protecting facework: Submit proposals.

780 Ground level

1. Commencement of facework: Not less than 150 mm below finished level of adjoining ground or external works level.

790 Putlog scaffolding

1. Use: Not permitted in facework.

800 Toothed bond

1. New and existing facework in same plane: Bond together at every course to achieve continuity.

830 Cleanliness

1. Facework: Keep clean.
2. Mortar on facework: Allow to dry before removing with stiff bristled brush.
3. Removal of marks and stains: Rubbing not permitted.

Ω End of Section

Q10

Kerbs/ edgings/ channels/ paving accessories

Types of kerbs/edgings and channels

110 Proprietary precast concrete

1. Description: KERBS
2. Standard: To BS EN 1340.
3. Manufacturer: Contractor's Choice
 - 3.1. Product reference: Contractor's choice
4. Recycled content: Contractor's choice
5. Designations: EF Edging, flat top
6. Size (width x height x length): as per Schedule
7. Finish: As cast
8. Colour: Natural
9. Bedding: as per Schedule
10. Joints generally: Dry, 2-3 mm gap
11. Sealant movement joints: Not required
12. Accessories: as required

180 Drainage channel systems with gratings

1. Manufacturer: ACO Technologies plc or equally approved subject to written approval from Contractor's Administrator
 - 1.1. Product reference: Submit proposals
2. Size: Nominal bore 150 mm
3. Finish: As cast
4. Colour: Natural
5. Bedding: Cement mortar
6. Joints generally: Drain unions as required
7. Cover gratings: Galvanized steel, slotted
 - 7.1. Fixings: Hexagon head bolts with black moulded polypropylene protective cover caps
 - 7.2. Finish/ Colour: Galvanized

Roads/paving accessories/ marking/ demarcation - Not Used

Laying

510 Laying kerbs, edgings and channels

1. Cutting: Neat, accurate and without spalling. Form neat junctions.
 - 1.1. Long units (450 mm and over) minimum length after cutting: 300 mm.
 - 1.2. Short units minimum length after cutting: The lower of one third of their original length or 50 mm.
2. Bedding of units: Positioned true to line and levelled along top and front faces, in a mortar bed on accurately cast foundations or on a race of fresh concrete.
3. Securing of units: After bedding has set, secured with a continuous haunching of concrete or on a race of fresh concrete with backing concrete cast monolithically.

520 Adverse weather

1. **Conditions:** Do not construct if the temperature is below 3°C on a falling thermometer or 1°C on a rising thermometer. Adequately protect foundations, bedding and haunching against frost and rapid drying by sun and wind.

530 Concrete for foundations, races and haunching

1. **Standard:** To BS 8500-2.
2. **Designated mix:** Not less than GEN0 or Standard mix ST1.
3. **Workability:** Very low.

540 Cement mortar bedding

1. **General:** To section Z21.
2. **Mix (Portland cement:sand):** 1:3.
 - 2.1. **Portland cement:** Class CEM I 42.5 to BS EN 197-1.
 - 2.2. **Sand:** to BS EN 12620, grade 0/4 or 0/2 (MP).
3. **Bed thickness:** 12-40 mm.

543 Lime mortar bedding

1. **General:** To section Z21.
2. **Mix:** Submit proposals
3. **Bed thickness:** 12-40 mm.

550 Kerb dowels

1. **Dowels:** Steel bar to BS 4482.
 - 1.1. **Size:** 12 mm diameter, 150 mm long.
2. **Installation of dowels:** Vertically into foundation while concrete is plastic.
 - 2.1. **Centres:** To suit holes in kerbs.
 - 2.2. **Projection:** 75 mm.
3. **Grouting of holes in kerbs:** Filled with 1:3 cement:sand mortar finished flush.

560 Haunching dowels

1. **Dowels:** Steel bar to BS 4482.
 - 1.1. **Size:** 12 mm diameter, 150 mm long.
2. **Installation of dowels:** Vertically into foundation while concrete is plastic.
 - 2.1. **Centres:** 450 mm.
 - 2.2. **Distance from back face of kerb:** 50 mm.
 - 2.3. **Projection:** 75 mm.
3. **Haunching:** Rectangular cross section, cast against formwork, fully enclosing and protecting dowels.

570 Channels

1. **Installation:** To an even gradient, without ponding or backfall.
2. **Lowest points of channels:** 6 mm above drainage outlets.

580 Drainage channel systems

1. **Installation:** To an even gradient, without ponding or backfall. Commence laying from outlets.

2. **Silt and debris:** Removed from entire system immediately before handover.
3. **Washing and detritus:** Safely disposed without discharging into sewers or watercourses.

590 Drainage channel systems with built in fall

1. **Installation:** Top of channels level, installed in correct sequence to form an even gradient without ponding or backfall. Commence laying from outlets.
2. **Silt and debris:** Removed from entire system immediately before handover.
3. **Washings and detritus:** Safely disposed without discharging into sewers or watercourses.

600 Radius kerbs/ channels

1. **Usage:** Radii of 15 m or less.

610 Angle kerbs

1. **Usage:** Internal and external 90° changes of direction.
2. **Cutting of mitres:** Not permitted.

620 Accuracy

1. **Deviations (maximum)**
 - 1.1. **Level:** ± 6 mm.
 - 1.2. **Horizontal and vertical alignment:** 3 mm in 3 m.

625 Regularity of paved surfaces

1. **Maximum undulation of (non-tactile) paving surface:** 3 mm.
 - 1.1. **Method of measurement:** Under a 1 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface).
2. **Difference in level between adjacent units (maximum)**
 - 2.1. **Joints flush with the surface:** Twice the joint width (with 5 mm max difference in level).
 - 2.2. **Recessed, filled joints:** 2 mm.
 - 2.2.1. **Recess depth (maximum):** 5 mm.
 - 2.3. **Unfilled joints:** 2 mm.
3. **Sudden irregularities:** Not permitted.

630 Narrow mortar joints

1. **Jointing:** Ends of units buttered with bedding mortar as laying proceeds. Joints completely filled, tightly butted and surplus mortar removed immediately.
 - 1.1. **Joint width:** 3 mm.

640 Tooled mortar joints

1. **Jointing:** Ends of units buttered with bedding mortar as laying proceeds. Joints completely filled and tooled to a neat flush profile.
 - 1.1. **Joint width:** 6 mm.

650 Sealant movement joints

1. **Joint filler:** Compressible cellular rubber or plastics compatible with specified sealant.
2. **Filler installation:** Built in as work proceeds, extending through haunching and foundation. Filler positioned accurately to fully support sealant at the recommended depth below exposed faces of units.
3. **Joint width:** 10 mm

4. Sealant: Contractor's choice
 - 4.1. Colour: Colour match to kerbs
5. Sealant application: As section Z22.

Ω End of Section

Q25

Slab/ brick/ sett/ cobble pavings

General

120 Concrete flag paving system

1. Subgrade improvement layer: As section Q20
 - 1.1. Compacted thickness: as per Schedule
2. Granular sub-base: As section Q20
 - 2.1. Compacted thickness: 300 mm
3. Base: as per Schedule
4. Laying course: Site mixed mortar
 - 4.1. Accessories: Submit proposals
5. Paving units: Concrete flags
6. Jointing: Site mixed mortar
 - 6.1. Bond: As indicated on Schedule

System performance

220 Design – concrete flag paving system

1. Design: Complete the design of the concrete slab paving system in accordance with BS 7533-4.
 - 1.1. Site category: IV, to BS 7533-4
2. Ground conditions: as per excavation
3. Performance criteria: To BS EN 1339
4. Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

Products

315 Concrete flags

1. Standard: To BS EN 1339.
 - 1.1. Manufacturer: Submit proposals
 - 1.1.1. Product reference: Submit proposals
2. Recycled content: Contractor's choice
3. Colour: Natural
 - 3.1. Finish: standard / natural
 - 3.2. Nominal sizes: 600 x 600 x 50 mm
4. Arrises: Square

380 Lime for site mixed mortar

1. Standard: Nonhydraulic to BS EN 459-1, -2 and -3, type CL 90 or, if ready-mixed lime:sand, to BS EN 998-2.

390 Sand/ fine aggregate for unbound laying course and jointing of concrete flag paving

1. Standard: To BS 7533-4, unbound construction laying course and jointing material.
2. Purity: Free from deleterious salts, contaminants, lime and cement.
3. Procurement: Obtain from one source and ensure consistent grading.

Execution

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.
3. Paving laid and jointed in sand/ fine aggregate
 - 3.1. Stockpiled laying course sand/ fine aggregate: Protect from saturation.
 - 3.2. Exposed areas of unbound laying course and uncompacted areas of unbound paving: Protect from heavy rainfall.
 - 3.3. Saturated unbound laying course: Remove and replace, or allow to dry before proceeding.
 - 3.4. Laying dry sand/ fine aggregate jointed paving in damp conditions: Brush in as much jointing sand as possible. Minimize site traffic over paving. As soon as paving is dry, top up joints and complete compaction.

625 Laying pavings – general

1. Appearance: Smooth and even with regular joints and accurate to line, level and profile.
2. Falls: To prevent ponding.
3. Bedding of paving units: Firm so that rocking or subsidence does not occur or develop.
 - 3.1. 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: Cut 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.

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): 3 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 max 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):** 4 days
 - 4.2. **Vehicular traffic (minimum):** 10 days
5. **Access:** Restrict access to paved areas to prevent damage from site traffic and plant.

650 Cementitious bases and sub-bases

1. **General:** Protect from moisture loss, if not covered by another pavement course within 2 hours of completion.

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 7533-7, 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.

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.

710 Laying flag and slab paving – sand/ fine aggregate laying course and jointing

1. **Standard:** In accordance with BS 7533-4.
2. **Flag installation and cutting:** To Interpave 'Concrete flag paving'.
3. **Joint width:** 2-5 mm.

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:** To Interpave 'Concrete flag paving'.
3. **Laying course**

760 Laying precast concrete and gravel paving

1. Laying: Tamp down into lightly compacted laying course.
 - 1.1. Nominal thickness of laying course after compaction: 15-25mm
2. Filling: Allow to settle and refill level with surface.

Completion

915 Completion of paving with dry sand or fine aggregate filled joints

1. Sand dressing: as per Schedule
2. Final compaction of the surface course: In accordance with BS 7533-3.
3. Vacuum cleaning machines: Not allowed.

Ω End of Section

R12

Below ground drainage systems

General

110 Below ground drainage system

1. Surface water and rainwater drainage sources: Submit proposals
2. Foul drainage sources: Submit proposals
3. Land drainage sources: Submit proposals
4. Pressure relief drainage sources: Submit proposals
5. Pipes, bends and junctions: Plastics - structured wall
 - 5.1. Accessories: Submit proposals
6. Manholes, inspection chambers, traps, and separators: Manholes and inspection chambers - brick, as section F10
 - 6.1. Accessories: Submit proposals
7. Disposal: To sewers
8. Accessories – general: Submit proposals

124 Soakaway system – granular fill

1. Description: Line bottom and sides of pit with geotextile membrane. Insert vertical inspection and distributor pipes and horizontal distributor pipes if required. Fill up to invert level of inlet pipe with granular material. Cover top with geotextile membrane before connecting inlet pipe to inspection and distribution pipe. Backfill with as-dug material.
2. Rainwater drainage sources: Submit proposals
3. Foul drainage sources: Submit proposals
4. Soakaways
 - 4.1. Geotextile: As section R17
 - 4.2. Granular fill – rubble: As section R17
5. Pipes, bends and junctions: Submit proposals PVC-U - solid wall perforated, as section R17

System performance

211 Design – below ground drainage systems

1. Design: Complete the design of the below ground drainage system in accordance with BS EN 752, BS EN 1295-1 and BS EN 1610.
2. Ground conditions: As per site
3. Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

221 Design – soakaway systems

1. Design: Complete the design of the soakaway system in accordance with BRE Digest 365.
2. Design life of system: 60 years
3. Proposals: Submit drawings, technical information, calculations and manufacturers' literature.
4. Maintenance requirements: Submit details.

Products

312 Adaptors to plastics drainage

1. **Material and standard:** Plastics to BS 4660 and Kitemark certified or to BS EN 1401-1 and Kitemark certified.
2. **Manufacturer:** Submit proposals
 - 2.1. **Product reference:** Submit proposals

315 One piece gullies and covers

1. **Standards:** To BS EN 1253-1, -2, -3, -4 and -5; or
 - 1.1. **Clay:** To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - 1.2. **Plastics:** To BS 4660 and Kitemark certified, or Agrément certified.
 - 1.3. **Polypropylene:** To BS EN 1852-1.
2. **Material:** Plastics
3. **Manufacturer:** Contractor's choice
 - 3.1. **Product reference:** Submit proposals
4. **Sizes:** Submit proposals
5. **Outlet sizes:** DN 100
6. **Covers:** Contractor's choice
 - 6.1. **Product reference:** Contractor's choice
 - 6.2. **Type:** Loose grating
 - 6.3. **Material:** Galvanized steel
 - 6.4. **Sizes:** as required
 - 6.5. **Loading grades to BS EN 124:** B125
7. **Silt buckets:** Plastics

329 Pipes, bends and junctions – supply

1. **Pipes and fittings:** From same manufacturer for each pipeline.

336 Pipes, bends and junctions – clay – flexible joints

1. **Material and standard:** Vitrified clay to BS EN 295-1, Kitemark certified.
2. **Manufacturer:** Submit proposals
 - 2.1. **Product reference:** Submit proposals
3. **Sizes:** DN 100 (subject to existing)

338 Pipes, bends and junctions – clay – rigid joints

1. **Material and standard:** Vitrified clay to BS 65.
2. **Manufacturer:** Submit proposals
 - 2.1. **Product reference:** Submit proposals
3. **Sizes:** DN 100 (subject to existing)
4. **Jointing type:** Spigot and socket with resin cement mortar joints.

344 Pipes, bends and junctions - plastics - structured wall

1. **Description:** FOUL DRAINAGE & SURFACE WATER DRAINAGE
2. **Standard:** Agrément certified

- 2.1. **Supplementary requirements:** Puncture resistance, jetting resistance and longitudinal bending to requirements of WIS 4-35-01, issue 2.
- 3. **Manufacturer:** Submit proposals
 - 3.1. **Product reference:** Submit proposals
- 4. **Sizes:** As required

357 Connectors – saddle

- 1. **Standards**
 - 1.1. **Cast iron:** To BS 437 and Kitemark certified, or Agrément certified.
 - 1.2. **Clay:** To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - 1.3. **Concrete:** To BS 5911-6 and Kitemark certified, or Agrément certified.
 - 1.4. **Plastics:** To BS 4660 and Kitemark certified, BS EN 13598-1 or Agrément certified.
- 2. **Material:** Plastics
- 3. **Manufacturer:** Contractor's choice
 - 3.1. **Product reference:** Submit proposals

359 Flexible couplings

- 1. **Standard:** To BS EN 295-4 or WIS 4-41-01 and Kitemark certified, or Agrément certified.

371 Rodding points

- 1. **Standards**
 - 1.1. **Cast iron:** To BS 437 and Kitemark certified, or Agrément certified.
 - 1.2. **Clay:** To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - 1.3. **Concrete:** To BS 5911-6 and Kitemark certified, or Agrément certified.
 - 1.4. **Plastics:** To BS 4660 and Kitemark certified, to BS EN 13598-1 or Agrément certified.
- 2. **Material:** Plastics
- 3. **Manufacturer:** Contractor's choice
 - 3.1. **Product reference:** Submit proposals
- 4. **Sizes:** DN 100

375 Sealed access fittings

- 1. **Standards**
 - 1.1. **Cast iron:** To BS 437 and Kitemark certified, or Agrément certified.
 - 1.2. **Clay:** To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - 1.3. **Plastics:** To BS 4660 and Kitemark certified, to BS EN 13598-1 or Agrément certified.
 - 1.4. **Polypropylene:** To BS EN 1852-1.
- 2. **Material:** Plastics
- 3. **Manufacturer:** Submit proposals
- 4. **Bends**
 - 4.1. **Product reference:** Submit proposals
- 5. **Branches**
 - 5.1. **Product reference:** Submit proposals
- 6. **Straights**
 - 6.1. **Product reference:** Submit proposals
- 7. **Raising pieces**

- 7.1. Product reference: Submit proposals
- 8. Covers
 - 8.1. Product reference: Submit proposals

407 Manholes and inspection chambers – concrete

- 1. Description: Plain in situ concrete
- 2. Standards
 - 2.1. To BS 5911-3 and BS EN 1917 and Kitemark certified; or
 - 2.2. To BS 5911-4 and BS EN 1917.
- 3. Manufacturer: Submit proposals
- 4. Cement type and content: To BS 5911-1 and BS EN 1916
- 5. Chamber sections
 - 5.1. Product reference: Submit proposals
 - 5.2. Jointing type: Mortar
- 6. Cover slabs
 - 6.1. Product reference: Submit proposals
 - 6.2. Thickness: 175 mm
 - 6.3. Openings: To suit access covers.
- 7. Steps: Required in chambers over 900 mm deep at 300 mm vertical centres staggered 300 mm horizontally, with top step not more than 450 mm below top of cover

409 Manholes – concrete – additional components for deep manholes

- 1. Standards
 - 1.1. To BS 5911-3 and BS EN 1917 and Kitemark certified; or
 - 1.2. To BS 5911-4 and BS EN 1917.
- 2. Manufacturer: Submit proposals
- 3. Cement type and content: To BS 5911-3 and BS EN 1917 and Kitemark certified; or to BS 5911-4 and BS EN 1917
- 4. Landing slabs
 - 4.1. Product reference: Submit proposals
- 5. Reducing slabs
 - 5.1. Product reference: Submit proposals
- 6. Straight backed tapers
 - 6.1. Product reference: Submit proposals
- 7. Shaft sections
 - 7.1. Product reference: Submit proposals

433 Manhole channels and branches – conventional

- 1. Description: Channels, branches and benching
- 2. Material: Clay
- 3. Manufacturer: Submit proposals
 - 3.1. Product reference: Submit proposals

439 Manhole steps

- 1. Description: TO ALL FULL ACCESS MANHOLES
- 2. Standard: To BS EN 13101.

3. **Manufacturer:** Submit proposals
 - 3.1. **Product reference:** Submit proposals
4. **Material:** Galvanized steel Bed in joints to chambers over 900 mm deep at 300 mm vertical centres staggered 300 mm horizontally, with top step not more than 450 mm below top of cover.

468 Precast concrete cover slabs

1. **Standard:** To BS 5911-3 and BS EN 1917 and Kitemark certified.
2. **Manufacturer:** Submit proposals
 - 2.1. **Product reference:** Submit proposals
3. **Size:** As drawing/Schedule
4. **Openings:** 600 x 600 mm (minimum)

473 Access covers and frames – precast concrete seatings

1. **Standards:** To BS 5911-3 and BS EN 1917 and Kitemark certified.
2. **Manufacturer:** Submit proposals
 - 2.1. **Product reference:** Submit proposals
3. **Opening sizes:** To suit access covers.

492 Geotextile membranes – filter

1. **Manufacturer:** submit proposals
 - 1.1. **Product reference:** Submit proposals

494 Geotextile membranes – impervious

1. **Manufacturer:** submit proposals
 - 1.1. **Product reference:** Submit proposals

496 Granular material – natural

1. **Standards:** To Water Industry Specification WIS 4-08-02 (as amended by WIS 4-08-02A, 2008).
2. **Supplier :** Submit proposals
3. **Recycled content:** Submit proposals
4. **Size:** Dependent on location – see Execution clauses in this section, and in sections R16, R17 and R18, if used.

497 Granular material – manufactured

1. **Standards:** To Water Industry Specification WIS 4-08-02 (as amended by WIS 4-08-02A, 2008).
2. **Material:** Manufacturer's standard
3. **Size:** Dependent on location – see Execution clauses in this section, and in sections R16, R17 and R18, if used.

498 Granular sub-base material

1. **Standard:** To Highways England Volume 1, 'Specification for Highway Works', Type 1 Unbound mixtures for sub-base.
2. **Recycled content:** Contractor's choice

Fabrication

510 Vermin gratings for outfalls and outlet headwalls

1. **Construction:** Mild steel frame extending 75 mm beyond pipe opening all around, with 25 mm maximum opening steel mesh grille. Top hinged on built-in fish-tail straps and with bottom pin lock.
2. **Finish:** Galvanized to BS EN ISO 1461 after fabrication.
3. **Submit:** Shop drawings.
 - 3.1. **Timing:** Before manufacture.

Execution

611 Existing drains

1. **Setting out:** Before starting work, check invert levels and positions of existing drains, sewers, inspection chambers and manholes against drawings. Report discrepancies.
2. **Protection:** Protect existing drains to be retained and maintain normal operation if in use.

613 Excavated material

1. **Turf, topsoil, hardcore, etc:** Set aside for use in reinstatement.

616 Selected fill for backfilling

1. **Selected fill:** As-dug material, free from vegetable matter, rubbish, frozen soil and material retained on a 40 mm sieve.
 - 1.1. **Compaction:** By hand in 100 mm layers.

623 Lower part of trench – general

1. **Trench up to 300 mm above crown of pipe:** Vertical sides, width as small as practicable.
 - 1.1. **Width (minimum):** External diameter of pipe plus 300 mm.

625 Lower part of trench – transition depth

1. **Trench widths up to 300 mm above crown of pipe (maximum)**
 - 1.1. DN 100 pipelines more than 6.0 m deep: 600 mm.
 - 1.2. DN 150 pipelines more than 5.4 m deep: 700 mm.
 - 1.3. DN 225 pipelines more than 4.0 m deep: 800 mm.
 - 1.4. DN 300 pipelines more than 2.9 m deep: 900 mm.

631 Type of subsoil

1. **General:** Where type of subsoil at level of crown of pipe differs from that stated for the type of bedding, surround or support, give notice.

635 Formation for beddings

1. **Timing:** Excavate to formation immediately before laying beddings or pipes.
2. **Mud, rock projections, boulders and hard spots:** Remove. Replace with consolidated bedding material.
3. **Local soft spots:** Harden by tamping in bedding material.
4. **Inspection of excavated formations:** Give notice.

641 Pipes at different levels in common trench

1. **Subtrench:** Permissible provided soil of step is stable and unlikely to break away.
 - 1.1. **Subtrench not permissible:** Trench depth as required for lower pipe. Increase thickness of bedding to upper pipe as necessary.
2. **Lower pipe:** Backfill with compacted granular material to at least half way up higher pipe.
3. **Clear horizontal distance between pipes (minimum)**
 - 3.1. Pipes up to DN 700: 350 mm.
 - 3.2. Pipes exceeding DN 700: 500 mm.

683 Laying pipelines

1. **Laying pipes:** To true line and regular gradient on even bed for full length of barrel with sockets (if any) facing up the gradient.
2. **Ingress of debris:** Seal exposed ends during construction.
3. **Timing:** Minimize time between laying and testing.

685 Jointing pipelines

1. **Connections:** Durable, effective and free from leakage.
2. **Junctions, including to differing pipework systems:** With adaptors intended for the purpose.
3. **Cut ends of pipes:** Clean and square. Remove burrs and swarf. Chamfer pipe ends before inserting into ring seal sockets.
4. **Jointing or mating surfaces:** Clean and, where necessary, lubricate immediately before assembly.
5. **Allowance for movement:** Provide and maintain appropriate clearance at ends of spigots as fixing and jointing proceeds.
6. **Jointing material:** Do not allow to project into bore of pipes and fittings.

687 Concrete surround for crossovers

1. **Class Z surround:** Provide where two pipelines (other than plastics pipes) cross with less than 300 mm separation.
 - 1.1. **Extent, on both pipes:** 1 m centred on the crossing point, and beyond as necessary to come within 150 mm of nearest flexible joints.

689 Pipelines passing through structures

1. **Pipelines that must be cast in or fixed to structures (including manholes, catchpits and inspection chambers):** Provide 600 mm long rocker pipes adjacent to the external face of the structure (or both faces where appropriate, e.g. walls to footings), with flexible joints at both ends.
 - 1.1. **Distance to rocker pipe from structure (maximum):** 150 mm.
2. **Provision for movement for pipelines that need not be cast in or fixed to structures (e.g. walls to footings)**
 - 2.1. Rocker pipes as specified above; or
 - 2.2. Openings in the structures to give 50 mm minimum clearance around the pipeline. Closely fit a rigid sheet to each side of opening to prevent ingress of fill or vermin.

695 Backdrop pipes outside manhole walls

1. **Excavation beneath backdrop pipe:** Backfill.
 - 1.1. **Material:** Concrete.
2. **Pipe encasement:**
 - 2.1. **Material:** Concrete.
 - 2.2. **Thickness (minimum):** 150 mm.

697 Installing flexible couplings

1. Ends of pipes to be joined: Cut cleanly and square.
2. Outer surfaces of pipes to be joined: Clean and smooth. Where necessary, e.g. on concrete or iron pipes, smooth out mould lines and/ or apply a cement grout over the sealing area.
3. Clamping bands: Tighten carefully to make gastight and watertight seals.

699 Connections to sewers

1. General: Connect new pipework to existing adopted sewers to the requirements of the adopting authority or its agent.

705 Initial testing of pipelines

1. Before testing
 - 1.1. Cement mortar jointing: Leave 24 h.
 - 1.2. Solvent welded pipelines: Leave 1 h.
2. Method: Block open ends of pipelines to be tested and pressurise. Air test short lengths to BS EN 1610.

711 Trench supports

1. Removal of trench supports and other obstacles: Sufficient to permit compacted filling of all spaces.

713 Installing root barriers

1. Root barrier installation: Full depth of excavation. Fit closely to trench wall nearest the tree.

715 Backfilling to pipelines

1. Backfilling above top of surround or protective cushion: Material excavated from trench, compacted in layers 300 mm (maximum) thick.
2. Heavy compactors: Do not use before there is 600 mm (total) of material over pipes.

718 Backfilling over concrete

1. Minimum times from placing concrete
 - 1.1. Backfilling generally: 24 h.
 - 1.2. Heavy compactors and traffic loads: 72 h.

720 Backfilling under roads and pavings

1. Backfilling from top of surround or protective cushion up to formation level: Granular sub-base material, laid and compacted in 150 mm layers.

722 Public roads and pavings – Eng, Wales, Scot

1. Excavating and backfilling of trenches: To Department for Transport 'Specification for the reinstatement of openings in highways'.

741 Installing inspection chambers – plastics

1. Bedding
 - 1.1. Material: Concrete
 - 1.2. Thickness (minimum): 150 mm
2. Surround
 - 2.1. Material: Concrete

- 2.2. Thickness (minimum): 150 mm
- 3. Concrete collar
 - 3.1. Material: Concrete
- 4. Seating: Brickwork as section F10

743 Installing concrete manholes

- 1. Bases
 - 1.1. Material: Concrete
 - 1.2. Thickness (minimum): 225 mm
- 2. Surround
 - 2.1. Material: Concrete
 - 2.2. Thickness (minimum): 150 mm
 - 2.3. Height: Full height
- 3. Backfilling
 - 3.1. Material: Not required Granular - manufactured, size 4/10 to BS EN 13242, to 100 mm above crown of pipes, then selected fill
 - 3.2. Compaction: By hand in 100 mm layers.

757 Laying conventional channels, branches and benching

- 1. Main channel: Bed solid in 1:3 cement:sand mortar.
 - 1.1. Branches: Connect to main channel at or slightly above invert level, but not higher than half channel level, so that discharge flows smoothly in direction of main flow.
 - 1.2. Branches greater than nominal size 150 mm: Connect the branch soffit level with the main drain soffit.
 - 1.3. Connecting angles more than 45° to direction of flow: Use three-quarter section channel bends.
- 2. Benching
 - 2.1. Material: Concrete.
 - 2.2. Profile: Rise vertically from top of main channel to a level not lower than soffit of outlet pipe, then slope upwards at 10% to walls.
 - 2.3. Topping
 - 2.4. Application: Before benching concrete has set, and with dense smooth uniform finish.

759 Laying preformed plastics channels, branches and benching

- 1. Main channel: Bed solid in 1:3 cement:sand mortar.
 - 1.1. Branches: Connect to main channel at or slightly above invert level, but not higher than half channel level, so that discharge flows smoothly in direction of main flow.
 - 1.2. Connecting angles more than 45° to direction of flow: Use three-quarter section channel bends.
- 2. Bedding: 1:3 cement:sand mortar. Use clips or ensure adequate mechanical key.
- 3. Benching
 - 3.1. Material: Concrete.
 - 3.2. Profile: Rise vertically from top of main channel to a level not lower than soffit of outlet pipe, then slope upwards at 10% to walls.
 - 3.3. Topping
 - 3.3.1. Application: Before benching concrete has set, and with dense smooth uniform finish.

761 Laying sealed access fittings, branches and benching

1. Unused branches: Fit caps.
2. Bedding: 1:3 cement:sand mortar.
3. Benching
 - 3.1. Material: Concrete.
 - 3.1.1. Profile: 10% fall from manhole walls to component rim.
 - 3.2. Topping
 - 3.2.1. Application: Before benching concrete has set, and with dense smooth uniform finish.

771 Installing outfalls

1. Pipe outflow invert (minimum): Seasonal peak level or 150 mm above normal water level, whichever is the higher.
2. Pipe surround and backfill to the last 2 m run of drain: Excavated subsoil, rammed home.

773 Installing access covers and frames

1. Seating: Brickwork as section F10
2. Bedding and haunching of frames: Continuously.
 - 2.1. Material: 1:3 cement:sand mortar
 - 2.2. Top of haunching: 30 mm below surrounding surfaces.
3. Horizontal positioning of frames
 - 3.1. Centred over openings.
 - 3.2. Square with joints in surrounding paving.
4. Vertical positioning of frames
 - 4.1. Level; or
 - 4.2. Marry in with levels of surrounding paving.
5. Permissible deviation in level of external covers and frames: +0 to -6 mm.

776 Exposed openings in inspection chambers, access points, fittings and equipment

1. General: Fit purpose made temporary caps. Protect from site traffic.

Completion

901 Removal of debris and cleaning

1. Preparation: Lift covers to manholes, inspection chambers and access points. Remove mortar droppings, debris and loose wrappings.
 - 1.1. Timing: Before cleaning, final testing, CCTV inspection if specified, and immediately before handover.
2. Cleaning: Thoroughly flush pipelines with water to remove silt and check for blockages. Rod pipelines between access points if there is any indication that they may be obstructed.
3. Washings and detritus: Do not discharge into sewers or watercourses.
4. Covers: Securely replace after cleaning and testing.

921 Final testing of private gravity drains and sewers up to dn 300

1. Before testing
 - 1.1. Cement mortar jointing: Leave 24 h.
 - 1.2. Solvent welded pipelines: Leave 1 h.

2. **Standard:** To Building Regulations.
3. **Method:** Water

941 Water testing of manholes and inspection chambers

1. **Timing:** Before backfilling.
2. **Standard**
 - 2.1. **Exfiltration:** To BS EN 1610.
 - 2.2. **Method:** Testing with water (method W).
 - 2.3. **Infiltration:** No identifiable flow of water penetrating the chamber.

978 Lifting keys

1. **Lifting keys:** Supply suitable keys for each type of access cover.
 - 1.1. **Timing:** At completion.

Ω End of Section

R17

Soakaway, septic tank and sewage treatment units

Products

305 Below-ground drainage systems – products

1. Products generally: As section R12.

355 Granular material – rubble

1. Material: Clean broken bricks, crushed rock or gravel, size range 150 mm to 50 mm with 30% voids

360 Geotextile membrane for granular fill soakaways

1. Manufacturer: Submit proposals
 - 1.1. Product reference: Submit proposals

Execution

605 Below-ground drainage systems – execution

1. Execution generally: As section R12.

625 Soakaways – granular fill

1. Geotextile membrane: Line bottom and sides of pit.
 - 1.1. Jointing: Overlap 300 mm.
2. Inspection and distributor pipes: Insert as required.
3. Fill: Granular material - rubble
 - 3.1. Height: Up to invert level of inlet pipe.
4. Top of fill: Cover with geotextile membrane.
5. Backfill: As-dug material
6. Access covers: Bed and haunch continuously in 1:3 cement:sand mortar.

650 Backfilling with as-dug material

1. Material: As excavated from the trench.
2. Placing and compaction: Maximum 300 mm thick layers, up to finished ground level. Compact each layer before placing the next
3. Heavy compactors: Do not use before there is 600 mm of material over pipes

Completion - Not Used

Ω End of Section

Z21 Mortars

Cement gauged mortars

110 Cement gauged mortar mixes

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

120 Sand for site made cement gauged masonry mortars

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

131 Ready-Mixed lime:sand for cement gauged masonry mortars

1. **Standard:** To BS EN 998-2.
2. **Lime:** Nonhydraulic to BS EN 459-1.
 - 2.1. **Type:** CL 90S.
3. **Pigments for coloured mortars:** To BS EN 12878.

135 Site made lime:sand for cement gauged masonry mortars

1. **Permitted use:** Where a special colour is not required and in lieu of factory made ready-mixed material.
2. **Lime:** Nonhydraulic to BS EN 459-1.
 - 2.1. **Type:** CL 90S.
3. **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

1. **Cement:** To BS EN 197-1 and CE marked.
 - 1.1. **Types:** Portland cement, CEM I.
 - 1.1.1. **Portland limestone cement,** CEM II/A-L or CEM II/A-LL.
2. **Portland slag cement,** CEM II/B-S.
3. **Portland fly ash cement,** CEM II/B-V.
 - 3.1. **Strength class:** 32.5, 42.5 or 52.5.
4. **White cement:** To BS EN 197-1 and CE marked.
 - 4.1. **Type:** Portland cement, CEM I.
 - 4.2. **Strength class:** 52.5.
5. **Sulfate resisting Portland cement**
 - 5.1. **Type:** To BS EN 197-1 Sulfate resisting Portland cement, CEM I/SR and CE marked.
6. **To BS EN 197-1 fly ash cement,** CEM II/B-V and CE marked.
 - 6.1. **Strength class:** 32.5, 42.5 or 52.5.

7. **Masonry cement:** To BS EN 413-1 and CE marked.
 - 7.1. **Class:** MC 12.5.

180 Admixtures for site made cement gauged mortars

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

190 Retarded ready to use cement gauged mortar

1. **Standard:** To BS EN 998-2.
2. **Lime for cement:lime:sand mortars:** Nonhydraulic to BS EN 459-1.
 - 2.1. **Type:** CL 90S.
3. **Pigments for coloured mortars:** To BS EN 12878.
4. **Time and temperature limitations:** Use within limits prescribed by mortar manufacturer.
 - 4.1. **Retempering:** Restore workability with water only within prescribed time limits.

200 Storage of cement gauged mortar materials

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

210 Making cement gauged mortars

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

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:** Sharp, well graded.
 - 1.1. **Quality, sampling and testing:** To BS EN 13139.
 - 1.2. **Grading/ Source:** As specified elsewhere in relevant mortar mix items.

330 Ready prepared lime putty

1. **Type:** Slaked directly from CL 90 quicklime to BS 890, using an excess of water.
 - 1.1. **Maturation:** In pits/ containers that allow excess water to drain away.
 - 1.2. **Density of matured lime putty:** 1.3 - 1.4 kg/litre.

345 Admixtures for hydraulic lime:sand mortars

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

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.

370 Site prepared nonhydraulic lime:sand mortars

1. **Mixing:** Mix materials thoroughly by compressing, beating and chopping. Do not add water.
 - 1.1. **Equipment:** Roller pan mixer or submit proposals.
2. **Maturation period before use (maximum):** Seek instructions

390 Knocking up nonhydraulic lime:sand mortars

1. **Knocking up before and during use:** Achieve and maintain a workable consistency by compressing, beating and chopping. Do not add water.
 - 1.1. **Equipment:** Roller pan mixer or submit proposals.

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.

Ω End of Section



Specification created using NBS Chorus