

Noma Marketing Suite
Civil Engineering Specifications

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date **27 October 2021**

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1 Introduction

1.1 Statement of Purpose

This report presents the specification for the permanent infrastructure and below ground drainage works associated with the construction of the proposed Noma marketing suite development.

1.2 General Requirements

The general specification for the construction of the works shall consist of the volumes of the contract documentation. Buro Happold will describe the external civil works. This document must be read in conjunction with Buro Happold Structural drawings and specifications, the Architectural drawings and specifications, and all other contract documentation, including any Site Investigation reports referred to herein.

The works described in this volume will generally constructed in accordance with the National Building Specification (Standard).

All publications referred to hereafter are to be the issues current at the date of invitation to tender.

For the road and pavement works, the specifications shall be:

Specification BH Q10 Kerbs/Edging/Channels;

Specification BH Q20 Granular Sub-bases to Roads/Pavements;

Specification BH Q22 Coated Macadam/Asphalt Roads/Pavings;

Specification BH Q24 Interlocking Brick/Block Road/Pavings

For the above podium slab, underslab and underground drainage works shown, the specifications shall be:

Specification BH R12 Drainage Above & Below Ground;

and

Sewers for Adoption 7th Edition.

References made to British Standards and other codes of practice signify those standards current at the date of issue of this document.

Inspection and acceptance of materials, contract drawings and workmanship by the Contract Administrator (CA), does not in any way relieve the Contractor of his responsibilities under the contract.

The works are to be executed as specified and in accordance with good practice. No changes are permitted without written approval.

The Contractor is to review the detail of this Specification and consider the times required for testing, preparation of samples and approval of information by the CA. This information is to be included in the contract programme.

The following materials are specifically precluded from all Specifications pertaining to works carried out under this contract:-

- Asbestos or asbestos-containing products, as defined in the United Kingdom

- Asbestos Regulations 1987 or any statutory modification or re-enactment thereof;
- Lead where the metal or its corrosive products may be directly ingested, inhaled or absorbed. Applications such as roofing, flashings, rainwater goods and copper alloy fittings containing lead which are specifically required are acceptable, until equal or better alternatives are available;
- Lead-based paints and primers;
- Urea Formaldehyde Foam or materials which may release formaldehyde; beyond British Standard Limits.
- Pitch Polymer dpc.
- Materials which generally comprise mineral fibres, either man-made or naturally occurring, which have a diameter of 3-microns or less and a length of 200 micros or less, or which contain any fibres not sealed, encapsulated or otherwise stabilised to ensure that fibre migration is prevented. Products that may contain fibres include insulation, fire protection and air filters.
- Materials in which CFC's, HCFC's or HFA's have been used as blowing agents.
- The source of species of hardwood from the tropical rainforest is not permitted unless they are obtained from a sustainable source.
- High alumina cement or concrete
- Wood wool slabs in permanent formwork.
- Calcium chloride in admixtures for use in reinforced concrete.
- Aggregates for use in reinforced concrete which do not comply with BS 882 and aggregates for use in concrete which do not comply with the provisions of BS 8110.
- Chlorofluorocarbons or any goods and/or materials containing the same.
- Polychlorinated biphenyls or any goods and/or materials containing the same.
- Calcium silicate bricks or tiles.
- CFC Based refrigerants.
- Sea dredged aggregates.
- Lindane – wood treatment/insecticidal spray.
- Mundic blocks/concrete.
- Pentachlorophenol – biocide/wood preservative.
- Tributyltin (TBT).
- PVC.
- Polyurethane or Polyisocyanate Foam.

The Contractor is required to ensure that all efforts be made, and using the best information available to him that these substances are not incorporated into the works. In the event that he is unwilling or unable to comply with these requirements he is to inform the CA in writing in sufficient time for consultations to be held and alternatives to be considered.

1.3 Scope of Works

The scope of works defined by this specification includes:

PAVEMENTS

Construct pavements and surfaces to roads, hard play areas, footpaths and paved areas in accordance with NBS specifications Q10, Q20, Q22 & Q24.

DRAINAGE

a) External Surface Water Drainage

Surface water run-off generated from the external hardstanding areas will be collected via a collection drainage system such as linear drains, slot drain, channel drain, gullies, permeable paving, etc.

The external surface water drainage system shall convey surface water into existing public sewer. External surface water drainage system includes, but is not limited to, clay and/or concrete, plastic pipework, , concrete/plastic manholes, plastic inspection chambers, linear drainage channels, connector pipes and associated works.

b) Foul Water

Foul water from the building shall be collected in a separate system and will be gravitated into a new or existing sewer manhole outside of the building footprint.

Foul water drainage above the ground slab shall be covered within the Building Services Specification, while this BH specification extends to all foul water ground slab installations, slab penetrations, underslab drainage and the external foul drainage system.

Foul water ground slab installations shall include, but not be limited to gullies (specified by public health engineer), inspection chambers, soil stacks and soil vent pipes.

Underslab foul water drainage shall connect to foul ground slab installations, sewer vent pipes (SVP's), waste vent pipes (WVP's) and stub stacks (S/S) which convey the foul water to the external belowground foul drainage system. The system includes, but is not limited to, all pipe work, bends and fittings.

The external foul drainage system includes, but is not limited to, clay pipework, cast iron, concrete and/or plastic manholes, plastic inspection chambers, vent pipes, connector pipes and associated works.

The Contractor shall make provision for the supply, installation (including electrical connection), operation and maintenance of temporary sump pumps and sumps (if required) to provide sufficient substructure drainage. The Contractor shall provide details of their method for temporary substructure drainage and approvals from relevant authorities for discharge to the CA for approval prior to commencement of works.

The Contractor is responsible for the design, co-ordination and construction of all temporary works, including temporary site drainage and all other temporary services required.

Where the Contractor proposes an alternative design he shall take responsibility for his design and co-ordination.

1.4 Programme of Works and Method of Statement

The Contractor shall provide a comprehensive and detailed programme for the works for the approval of the CA. The Contractor shall take due regard of the contents of this specification in the programme to undertake the necessary exploratory investigations and co-ordination with other works.

The Contractor shall provide for the approval of the CA detailed method statements, with all necessary exploratory drawings and diagrams, showing the method, techniques and resources the Contractor intends to employ to complete the works.

1.5 Traffic Safety and Control

Controls: Provide, erect and maintain all such traffic signs, barriers and control signals as may be necessary in accordance with the recommendations of Chapter 8 of the Traffic Signs Manual or such other General Directions as are current at the time of execution of the works.

Where the particular circumstances are not covered by these recommendations, the Contractor shall submit proposals for approval to the CA and relevant Highways Authority.

Compliance with this clause does not relieve the Contractor of any other obligations under the Contract or under the relevant provision of the Highway Acts.

Co-ordination: For any works on the Public Highway the Contractor is to co-ordinate his activities with the Highway Authority and to be responsible for obtaining all necessary permits and approvals. Any charges for reinstatement of the Highway are to be met by the Contractor.

Submission by Contractor: After consultations with the appropriate authority submit a programme showing the scheme of traffic management. Thereafter provide such further details and information as required by the CA.

No work affecting the public or private highway(s) is to be started until all traffic control measures are agreed as being fully operational.

Equipment: Unless otherwise specified all traffic signs to comply with BS 873, and danger lamps with BS 3143.

All traffic signs to be kept clean and legible at all times and to be repositioned, covered, or removed as required.

All adjacent public highways and trafficked/pedestrian routes to be kept clear of all construction debris. Tracked vehicles are not to travel over public highways without permission of the CA.

Making good: Any damage caused to public highways and trafficked/pedestrian routes to be made good as directed by the CA.

1.6 Temporary Diversion of Traffic

Construct temporary diversion ways wherever the works interfere with existing public or private roads or where there is a public or private right of way.

The standard of construction and lighting and the width of the diversion route to be agreed with the CA.

Construct diversion ways in advance of any interference with existing ways. Maintain in such a way as to provide adequately for traffic flows.

Where any temporary diversion works affect Public Highways the Contractor is responsible for obtaining all necessary Statutory Authority approvals.

The provisions of this clause do not apply to any temporary access or other works that the Contractor may construct for his sole usage.

1.7 Noise and Security

Noise: Comply with the general recommendations of BS 5228 together with any specific requirements described in the Contract Documents.

Security: Erect and maintain temporary fencing as shown on the Architectural drawings. Access past the fencing to be agreed with the CA.

Temporary fencing is to remain in position until permanent fencing or completion of the works replaces it. Proposals to be submitted to the CA for approval.

Regularly inspect all temporary fencing and permanent fencing and make good any defects.

If fencing must be removed for any part of the works, it shall be reinstated as soon as possible. In the interim provide patrols so as to preclude unauthorised entry into the site.

1.8 The Site

SITE INVESTIGATION: Site investigation reports have been produced and the Contractor shall familiarise himself with these reports

EXISTING DRAINAGE & SERVICES: Prior to construction, the Contractor shall be responsible for determining the position and extent of all existing underground and overhead drainage and services.

SITE FEATURES: Before starting work verify with the CA which existing fences, gates, walls, roads, paved areas and other site features are to be relocated or removed. Materials arising are to be removed from site or stockpiles as advised by the CA.

TREES: Before starting work verify with the CA, which trees, shrubs and hedges are to be relocated or removed. Cut down, grub up main roots and fill voids with approved material. Dispose of all arisings.

UNDERGROWTH: Clear site of bushes, scrub and undergrowth. Grub up and dispose of large roots.

CULTIVATED TURF: Before starting work verify with the CA, which areas of turf are to be retained. At the Contractor's discretion, cost and/or profit, other turf may be either:

- lifted and sold, or
- left to be incorporated with the existing topsoil.

SITE ACCESS AND WORKING AREA: Access to the site and the Contractor's working area will be agreed with the CA. The Contractor is to provide, to the approval of the CA:

- all necessary signs, safety measures and watchmen to ensure security and safe operation of his traffic
- all necessary servicing for his own offices, stores, workshops, CA's offices etc.
- Access routes for the Employer, CA and other approved personnel.

ACCOMMODATION WORKS: The relocation and/or replacement of fences, walls, accesses etc. to properties bounding the site to be completed in an expeditious manner and within a time as approved by the CA. The Contractor is to give the CA at least 10 days notice before starting the works.

1.9 Existing Services

The Contractor is responsible for confirming the position of all existing services prior to commencing works (including statutory undertakers' services).

The Contractor is responsible for providing all protection works to prevent damage to all existing services, including drainage. The operation of any service must not be interrupted without consent of the CA (including Statutory undertakers' services) and approval from statutory authority.

Liability: The Contractor is responsible for all costs associated with breakage, damage and interruption of supply. Confirm with the CA that appropriate insurance is held.

Privately owned services: If any privately owned service (water, electricity, drainage etc.) passing through the site is affected by the works, the Contractor is to provide a satisfactory alternative service and notify the CA of the measures proposed.

The Contractor shall replace any damaged services, marker tapes or protective covers disturbed during site operations to the CA's approval, at his own cost.

Existing Manholes / Access Chambers: The Contractor is to make provision for raising all existing manholes / access chambers including but not limited to:

- Inspecting all chambers, noting size, condition and type and submission with proposed method of work to the CA for approval before proceeding.

Works carried out in accordance with Sewers for Adoption 6th Edition and Section BH R12 of this specification.

1.10 Services Affected by Demolition/Construction Work

SERVICES REGULATIONS: Any work carried out to or which affects new or existing services must be in accordance with the bylaws or regulations of the relevant statutory authority.

LOCATION OF SERVICES: Locate and mark the positions of services affected by the work. Arrange with the appropriate authorities for the location and marking of the positions of mains services.

DISCONNECTION OF SERVICES: Before starting demolition arrange with the appropriate Authorities for the disconnection of services and removal of fittings and equipment. Before starting demolition ensure that disconnections have been carried out.

DISCONNECTION OF DRAINS: Locate and disconnect all disused drain connections. Grout fill disused drains up to 300mm diameter, all others to be removed in accordance with the Building Regulations. Abandoned drains are to be recorded on the as-constructed drawings.

DRAINS IN USE: Protect drains, manholes, gullies, vent pipes and fittings still in use and ensure that they are kept free of debris at all times. Make good any damage arising from demolition work and leave clean and in working order at completion.

BYPASS CONNECTIONS: Provide as necessary to maintain continuity of services to occupied areas of the same and adjoining properties. Give a minimum 72 hours notice to occupiers if shutdown is necessary during changeover.

SERVICES WHICH ARE TO REMAIN: notify the CA and service authority or owner of any damage. Make all arrangements for repair to the satisfaction of the CA and service authority or owner. The Contractor shall bear any costs arising from these works.

1.11 Special Requirements in Relation to all Utilities

The Contractor is responsible for confirming the position of all existing services prior to commencing works (this includes private and Statutory Undertakers Services).

The Contractor is to make allowance in the tender sum for the provision for new services required for the Contractor's compound. The scope of works and associated costs are to be included in the final tender sum. It is the Contractor's responsibility to obtain all necessary approvals from the relevant authorities and CA. The required services for the compound must not impact or conflict with the existing and proposed new services shown in the design drawings. The Contractor shall also allow in the cost of works for the removal or abandonment of the services prior to leaving the site.

The Contractor shall make arrangements with the appropriate Statutory Undertakers for the co-ordination of his work with all work which needs to be undertaken by them or their contractors concurrently with the Works, including work undertaken within the Public Highway. The Contractor shall include in his own construction program for the activities of the Statutory Undertakers and their contractors. Work undertaken on or adjacent to services shall be in accordance with any specifications and conditions required by the Apparatus Statutory Undertaker.

The Contractor shall make arrangements with the Statutory Undertakers and others concerned for the phasing of all necessary disconnections and diversions of private services affected by the Works.

Disconnected apparatus shall be removed by the Contractor only with the prior consent of the authority concerned. Such disconnection shall be notified to the Engineer.

The Contractor shall ascertain and confirm, before works are commenced, from the various public authorities, statutory undertakers and other utility facilities, the positions and depths of all existing above and below ground mains, pipes and cables and other apparatus which may be affected by the works. The Contractor shall take all measures required for the protection of these mains, pipes and cables and other apparatus during the progress of the work. The Contractor shall satisfy the Engineer that the relevant authorities and services owners have approved the measures to be used.

The Contractor shall allow in the tender sum for inconvenience in working around existing services, drains and sewers and for taking all necessary precautions to avoid interruptions, disruptions and damage to existing infrastructure/services. The positions of any existing services, drains and sewers met with during excavations shall be recorded by the Contractor and reported to the Engineer.

In no circumstances shall any private or public mains, pipes, cables or other apparatus be disturbed in any way without the written consent of the CA, the Engineer and the local authority, Public undertaking or service facility concerned. Warning notices to this effect shall be provided in all appropriate places to this effect.

The Contractor shall report any damage to existing services, drains or sewers immediately upon occurrence to the relevant authority or owner, and also to the Engineer. The Contractor shall indemnify the Employer against the actual and consequential costs of any and all repairs necessary because of damage or disturbance to any existing service, drains or sewers during the progress of the works.

Materials General

Notwithstanding the specific requirements of the specification, it shall be warranted by the Contractor that the Contractor shall not use, knowingly authorise, cause to be used, use or knowingly suffer the use on or in relation to the Project, without the prior written consent of the Client any untested material or materials which, although not in themselves untested, are being used in a manner or combination which is untested.

Notwithstanding the specific requirements of the specification all materials and equipment to be incorporated in the permanent works, must be new and of good quality. You warrant that you will supply and/or use new and good quality materials and equipment and will ensure that all such materials used are new and of good quality.

Refer to Clause 1.2 of this Specification for materials specifically precluded from all specifications pertaining to works carried out under this contract.

The Contractor is required to ensure that all efforts be made, and using the best information available to him that these substances are not incorporated into the works. In the event that he is unwilling or unable to comply with these requirements he is to inform the CA in writing in sufficient time for consultations to be held and alternatives to be considered.

1.12 Submission to be made by the Contractor

Clause No	Item	Min Time of Submission or Notice
General		
With respect to the works commencing on site:		
1.3	As-Constructed Drawings	Submit draft of reasonable standard prior to Practical Completion.
1.4	Programme for works	Submit 14 days before start on site
1.4	Work Method Statements	Submit 14 days before start on site
1.5	Traffic management	Submit 14 days before start on site
1.7	Temporary Fencing	Submit 14 days before start on site
1.7	Accommodation Works	Notify CA before start on site
Q20/211, 220	Sub-base certificates	As soon as available
Q22/220, 230	Certificate and Samples of bituminous material	As soon as available
Q24/220	Material Samples	As soon as available
R12/900	Drainage Network Test results	As soon as available

Note : Materials tests certificates are required to be submitted prior to Practical Completion.

2 Q10 Kerbs/ edgings/ channels/ paving accessories

TO BE READ WITH PRELIMINARIES/ GENERAL CONDITIONS.

2.1 TYPES OF KERBS/EDGINGS AND CHANNELS

110 PROPRIETARY PRECAST CONCRETE KERBS

- Standard: To BS EN 1340.
- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Recycled content: 75% (minimum) to BS EN ISO 14021.
- Designations: Edge kerb.
- Size (width x height x length): As per landscape architect's specification.
- Special shapes: As per landscape architect's specification.
- Finish: As per landscape architect's specification.
- Colour: As per landscape architect's specification.
- Bedding: As per landscape architect's specification.
- Joints generally: As per landscape architect's specification.
- Sealant movement joints: Not required.
- Accessories: None.

180 DRAINAGE CHANNEL SYSTEMS WITH GRATINGS

- Manufacturer: ACO.
 - Product reference: Multidrain M100D No 0.0.
- Size: Nominal bore 100 mm.
- Type of fall: Constant depth.
- Finish: As per landscape architect's specification.
- Colour: As per landscape architect's specification.
- Accessories: As per landscape architect's specification.
- Bedding: Cement mortar.
- Joints generally: As per landscape architect's specification.
- Cover gratings: As per landscape architect's specification.
 - Fixings: As per landscape architect's specification.
 - Loading grade to BS EN 124: B125.
 - Finish/ Colour: As per landscape architect's specification.
- Accessories:
 - Endcaps-outlets;
 - Inspection unit channels;
 - Sump units;and
 - Foul roddable air trap

2.2 LAYING

510 LAYING KERBS, EDGINGS AND CHANNELS

- Cutting: Neat, accurate and without spalling. Form neat junctions.
 - Long units (450 mm and over) minimum length after cutting: 300 mm.
 - Short units minimum length after cutting: The lower of one third of their original length or 50 mm.
- 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.
- 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

- 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

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

540 CEMENT MORTAR BEDDING

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

547 BEDDING/BACKING OF UNITS ON FRESH CONCRETE RACES

- Standard: To BS 7533-6.

550 KERB DOWELS

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

570 CHANNELS

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

580 DRAINAGE CHANNEL SYSTEMS

- Installation: To an even gradient, without ponding or backfall. Commence laying from outlets.
- Silt and debris: Removed from entire system immediately before handover.
- Washing and detritus: Safely disposed without discharging into sewers or watercourses.

600 RADIUS KERBS/ CHANNELS

- Usage: Radii of 15 m or less.

610 ANGLE KERBS

- Usage: Internal and external 90° changes of direction.
- Cutting of mitres: Not permitted.

620 ACCURACY

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

625 REGULARITY OF PAVED SURFACES

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

3 Q20 Granular Sub-bases to Roads/ Pavings

To be read with Preliminaries/ General conditions.

110 THICKNESSES OF SUB-BASE/ SUBGRADE IMPROVEMENT LAYERS

- Thicknesses: See sections:
Refer to drawing 0042512-BHE-XX-XX-DR-C-2100.

120 CHECKING OF SUBGRADES

- Anticipated subgrade conditions:
 - Soil type: To be confirmed.
 - Plasticity index: To be confirmed.
 - CBR (minimum): Assumed to be 5.0% , to be confirmed.
 - Depth below formation level to groundwater table: To be confirmed.
- Subgrade variation: If material appears to vary from anticipated conditions, or if there are extensive soft spots, report condition and await instruction before proceeding.
- Submit: Results and obtain instructions before proceeding.

140 EXCAVATION OF SUBGRADES

- Final excavation to formation or subformation level: Carry out immediately before compaction of subgrade.
- Soft spots and voids: Give notice.
- Old drainage and service trenches: Give notice.
- Wet conditions: Do not excavate or compact when the subgrade may be damaged or destabilized.

145 PREPARATION AND COMPACTION OF SUBGRADES

- Timing: Immediately before placing sub-base.
- Soft or damaged areas: Excavate and replace with sub-base material, compacted in layers 300 mm (maximum) thick.
- 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.

150 SUBGRADES FOR VEHICULAR AREAS

- Preparation and treatment: To Highways Agency 'Specification for highway works', clauses 616 and 617.

170 GEOTEXTILE FILTER/ SEPARATOR MEMBRANE Block paving with permeable infiltration joint

- Manufacturer: Submit proposals.
 - Product reference: Submit proposals.
- Jointing: As per manufacturer's specification.
- Protect from:
 - Exposure to light, except during laying (maximum five hours).
 - Contaminants.
 - Materials listed as potentially deleterious by geotextile manufacturer.
 - Damage, until fully covered by fill.
 - Wind uplift, by laying not more than 15 m before covering with fill.
- Preparation: Remove humps and sharp projections and fill hollows before laying.

175 IMPERMEABLE MEMBRANE BELOW SUB-BASE

- Manufacturer: Submit proposals.
 - Product reference: Submit proposals.
- Jointing: 300 mm overlap.
- Protect from:
 - Exposure to light, except during laying (maximum five hours).
 - Contaminants.
 - Materials listed as potentially deleterious by geotextile manufacturer.
 - Damage, until fully covered by fill.
 - Wind uplift, by laying not more than 15 m before covering with fill.
- Preparation: Remove humps and sharp projections and fill hollows before laying.
- Other requirements: None.

180 NOTICE

- Give notice: After preparation and compaction of subgrades.
 - Period of notice: 5 working days.

210 HIGHWAYS AGENCY TYPE 1 UNBOUND MIXTURE FOR SUB-BASE

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

211 GRANULAR MATERIAL

- 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:
 - Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
 - Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - Gravel or hoggins with not more clay content than is required to bind the material together, and with no large lumps of clay.
 - Natural gravel.
 - Natural sand.
- Filling: Spread and levelled in 150 mm maximum layers, each layer thoroughly compacted.

220 FROST SUSCEPTIBLE GRANULAR MATERIAL

- Definition (non frost susceptible material): To Highways Agency 'Specification for highway works' clause 801.8.
- Depth of frost susceptible material below final surface of paving (minimum): 450 mm.
- Testing: Test materials used if required and supply certificates.

230 PLACING GRANULAR MATERIAL GENERALLY

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

240 LAYING GRANULAR SUB-BASES FOR VEHICULAR AREAS

- General: Spread and levelled in layers. As soon as possible thereafter compact each layer.
- Standard: To Highways Agency 'Specification for highway works' clause 802.

- At drainage fittings, inspection covers, perimeters and where local excavation and backfilling has taken place: Take particular care to compact fully.

250 LAYING GRANULAR SUB-BASES FOR PEDESTRIAN AREAS

- General: Spread and levelled.
- Compaction:
 - Timing: As soon as possible after laying.
 - 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

- Permissible deviation from required levels, falls and cambers (maximum):
 - Subgrades:
 - Roads and parking areas: +20 -30 mm.
 - Footways and recreation areas: $\pm$ 20 mm.
 - Sub-bases:
 - Roads and parking areas: +10 -10 mm.
 - Footways and recreation areas: +5 -10 mm.

330 COLD WEATHER WORKING

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

340 PROTECTION

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

4 Q21 In Situ Concrete Roads/ Pavings/ Bases

To be read with Preliminaries/ General conditions.

4.1 JOINTS

410 JOINTS GENERALLY

- Layout: All joints to be accurately located, straight and well aligned.
- Construction joints made at end of working day: Form as contraction joints.
- Modifications to joint design or location: Submit proposals.
- Temporary support: Prior to concreting, set formwork, dowel bars, tie bars, joint filler boards, sealing groove fillets and the like rigidly in position and support to prevent displacement. Maintain support until concrete has set.
- Keep clean:
 - Do not allow concrete to enter gaps or voids in formwork or to render movement joints ineffective.
 - Do not allow concrete to impregnate or penetrate materials used as compressible joint fillers.

440 LONGITUDINAL CONSTRUCTION JOINTS

- Definition: Longitudinal joints are those parallel to the main axis of the paving.
- Standard: To Concrete Society Technical Report 28.
- Formed groove:
 - Size (minimum width x depth): 15 x 13 mm.
 - Preparation: Repair damaged edges of initially cast slab prior to forming groove.
 - Method: Fix preformed fillet against top edge of the initially cast slab before placing the adjacent slab. Remove when concrete is fully cured.
- Completion: Round upper edges of slabs at joints to 5 mm radius. Do not overwork concrete.

450 CONTRACTION JOINTS WITH SAWN GROOVE

- Standard: To Concrete Society Technical Report 28.
- Temperature: Do not start sawing if temperature is falling.
- Sawn groove:
 - Timing: Cut as early as possible after the slab has been placed but without causing edges of groove to spall.
 - Width (minimum): 3 mm.
 - Depth: 3 mm per 10 mm depth of slab or 50 mm, whichever is the greater.
- Upper portion of joint: Enlarge by sawing a groove:
 - Width (minimum): 13 mm.
 - Depth: 25 mm.

470 EXPANSION JOINTS

- Joint filler board:
 - Type: Bitumen impregnated fibre board.
 - Standard: To Highway Agency 'Specification for Highway Works', clause 1015.
 - Thickness: 25 mm.
 - Depth: Joint filler board must extend from underside of sealing groove fillet to full depth of slab to provide complete separation of adjacent slabs.

- Holes for dowel bars: Accurately bored or punched holes to form a sliding fit for dowel bars.
- Completion: Round upper edges of slabs at joints to 5 mm radius. Do not overwork concrete.

5 Q24 Interlocking brick/ block roads/ pavings

To be read with Preliminaries/ General conditions

5.1 TYPES OF PAVING

110 NATURAL STONE FLAG PAVING

- Granular sub-base: Highways agency type 1 unbound mixture, as section Q20
 - Compacted thickness: Refer to DWG 0042512-BHE-XX-XX-DR-C-2100
- Base:
 - Material: as shown on drawing 0042512-BHE-XX-XX-DR-C-2100
 - Thickness: Refer to DWG 0042512-BHE-XX-XX-DR-C-2100
- Laying course:
 - Material: In accordance with BS 7533-3.
 - Method of screeding, in accordance with BS 7533-3. Contractors choice of compacted or uncompacted.
 - Thickness: Refer to DWG 0042512-BHE-XX-XX-DR-C-2100
- Paving units: Refer to landscape architect's specification
 - Min depth: TBC
- Jointing:
 - Material: In accordance with BS 7533-3
 - Joint width: 8-12mm

5.2 EXECUTION

620 ADVERSE WEATHER

- General:
 - 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.
 - Frozen materials: Do not use. Do not lay bedding on frozen or frost covered bases.
- Paving with mortar joints and/ or bedding:
 - Protect from frost damage, rapid drying out and saturation until mortar has hardened.
- Paving laid and jointed in sand:
 - Stockpiled bedding sand: Protect from saturation.
 - Exposed areas of sand bedding and un-compacted areas of sand bedded paving: Protect from heavy rainfall.
 - Saturated sand bedding: Remove and replace, or allow to dry before proceeding.
 - Laying dry-sand 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

- Appearance: Smooth and even with regular joints and accurate to line, level and profile.
- Falls: To prevent ponding.
- Bedding of paving units: Firm so that rocking or subsidence does not occur or develop.
 - Bedding/ Laying course: Consistently and accurately graded, spread and compacted to produce uniform thickness and support for paving units.
- Slopes: Lay paving units upwards from the bottom of slopes.
- Paving units: Free of mortar and sand stains.
- Cutting: Cut units cleanly and accurately, without spalling, to give neat junctions with edgings and adjoining finishes.

630 LEVELS OF PAVING

- Permissible deviation from specified levels:
 - Generally: ± 6 mm.
- Height of finished paving above features:
 - At gullies: +6 to +10 mm.
 - At drainage channels and kerbs: +3 to +6 mm.

500 REGULARITY OF PAVED SURFACES

- 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):
 - Precast concrete paving blocks and clay pavers for flexible pavements: 10 mm.
- Difference in level between adjacent paving units (maximum): 2 mm.
- Sudden irregularities: Not permitted.

505 REGULARITY OF PAVED SURFACES

- 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.
- Joints between paving units or utility access covers:
 - 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).
 - 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.
 - Unfilled joints: difference in level between adjacent units to be no greater than 2 mm.
- Sudden irregularities: Not permitted.

5.3 COMPLETION**615 COMPLETION OF PAVING**

- Final compaction of the surface course: In accordance with BS 7533-3.
- Vacuum cleaning machines: Not allowed.

6 R12 Below ground drainage systems

To be read with Preliminaries/ General conditions.

6.1 GENERAL

100 EXISTING DRAINS

Before starting work, check invert levels and positions of existing drains, sewers, inspection chambers and manholes against drawings and report any discrepancies to CA.

Adequately protect existing drains and services and maintain normal operation during construction.

103 SEQUENCE OF WORKS

It is advised that the Contractor commence work at the downstream end of the drainage network where appropriate.

106 IN SITU CONCRETE FOR USE IN DRAINAGE BELOW GROUND

Concrete shall conform to: BS 8500-2:2002.

Parameter	Normal Use	Dry mix for benching and haunching
Compressive strength	C16/20	C16/20
DC Class	DC-2	
Cement or combination group	Refer to BS 8000- 1: 2006 Table A.6	
Maximum aggregate size	20mm	
Chloride Class	CI0,40	
Consistence Class	S3	S1

All buried concrete products and mortars are to contain DS-2(AC-15) sulphate resisting cement.

6.2 TYPES OF PIPELINES

110 BELOW GROUND DRAINAGE SYSTEM Foul Water Network

- Surface water and rainwater drainage sources: None.
- Foul drainage sources: Discharge stack and branch pipes, as section R11.
- Land drainage sources: None .
- Pressure relief drainage sources: None .
- Pipes, bends and junctions:
 - Cast iron - grey;
 - Clay - flexible joints;
 - Plastics - structured wall; and
- PVC-U - solid wall.
 - Accessories: Warning marker tapes.
- Manholes, inspection chambers, traps, and separators: Inspection chambers - plastics and Manholes and inspection chambers - concrete.

- Accessories:
 - Manhole channels and branches - conventional;
 - Manhole channels and branches - preformed plastics;
 - Manhole steps; and
- Sealing for concrete manholes - mortar.
- Disposal: To sewers via existing Highway drain within the site.
- Accessories – general: Access covers and frames.
- Non return valves: 150 dia. Mission Rubber or similar approved as noted on drawings

111 BELOW GROUND DRAINAGE SYSTEM **Surface Water Network**

- • Surface water and rainwater drainage sources: Rainwater downpipes, as section R10.
- • Foul drainage sources: None.
- • Land drainage sources: None.
- • Pressure relief drainage sources: None.
- Pipes, bends and junctions:
 - - Cast iron - ductile;
 - - Clay - flexible joints;
 - - Concrete;
 - - Plastics - structured wall; and
 - - PVC-U - solid wall.
- •Manholes, inspection chambers, traps, and separators: Manholes and inspection chambers - Concrete.
- Accessories:
 - - Manhole channels and branches - conventional;
 - - Manhole channels and branches - preformed plastics;
 - - Manhole steps; and
 - - Sealing for concrete manholes - mortar.
- • Disposal: To sewers via existing Highway drain within the site.
- • Accessories – general: Access covers and frames.
- • Orifice plate: 50mm dia. Orifice plate as noted on drawings.

211 DESIGN – BELOW GROUND DRAINAGE SYSTEMS

- Design: Complete the design of the below ground drainage system in accordance with BS EN 752, BS EN 1295-1 and BS EN 1610.
- Ground conditions: To be confirmed.
- Performance criteria: Assumed ground condition - made ground.
- Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

6.3 PRODUCTS

311 ADAPTORS TO CLAY DRAINAGE **Foul Water Network**

- Material and standard: Polypropylene to BS EN 295-1 and Kitemark certified.
- Type: DN 100 discharge stack to DN 100 clay.
- Manufacturer: Submit proposals.
 - Product reference: Submit proposals.

312 ADAPTORS TO PLASTIC DRAINAGE Foul and Surface Water Network

- Material and standard: Plastic to BS 4660 and Kitemark certified or to BS EN 1401-1 and Kitemark certified.
- Type: DN 100 rainwater pipe to DN 100 plastic.
- Manufacturer: Submit proposals.
 - Product reference: Submit proposals.

329 PIPES, BENDS AND JUNCTIONS - SUPPLY

- Pipes and fittings: From same manufacturer for each pipeline.

332 PIPES, BENDS AND JUNCTIONS - CAST IRON - DUCTILE Surface Water Drainage

- Standard: To BS EN 598, Kitemark certified.
- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.
- Sizes: DN 100.
- Additional corrosion protection: None.
- Jointing type: Push fit spigot and socket.

334 PIPES, BENDS AND JUNCTIONS - CAST IRON - GREY Foul Drainage

- Standard: To BS 437, Kitemark or Agrément certified.
- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.
- Sizes: DN 100.
- Additional corrosion protection: None.
- Jointing type: Flexible joint.

336 PIPES, BENDS AND JUNCTIONS - CLAY - FLEXIBLE JOINTS FW and SW Networks

- Material and standard: Vitrified clay to BS EN 295-1, Kitemark certified.
- Manufacturer: Submit proposals.
 - Product reference: Submit proposals.
- Sizes: Refer to drawings.
- Crushing strength (minimum): FN 40.
- Jointing type: Spigot and socket joints with sealing ring.

344 PIPES, BENDS AND JUNCTIONS - PLASTICS - STRUCTURED WALL Foul and Surface Water Drainage

- Standard: To BS EN 13476-1 and -2 or -3, Kitemark or Agrément certified.
 - Supplementary requirements: Puncture resistance, jetting resistance and longitudinal bending to requirements of WIS 4-35-01, issue 2.
- Material: PE.
- Manufacturer: Polypipe.
 - Product reference: Polysewer/Ridgisewer.
- Recycled content: 75% (minimum) to BS EN ISO 14021.
- Sizes: DN 100, 150 & 300.
- Jointing type: Spigot and socket.

359 FLEXIBLE COUPLINGS FW and SW Drainage

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

- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.

401 INSPECTION CHAMBERS - PLASTICS recessed manhole cover

- Standard: To BS EN 13598-1, BS EN 13598-2 or Agrément certified.
- Diameter: 600mm.
- Manufacturer: Contractor's choice.
- Bases:
 - Product reference: Contractor's choice.
- Shaft units:
 - Product reference: Contractor's choice.
- Access covers and frames:
 - Product reference: Contractor's choice.
 - Loading grades to BS EN 124: refer to drawing 0042512-BHE-XX-XX-DR-C-3100.

407 MANHOLES AND INSPECTION CHAMBERS - CONCRETE FW and SW drainage

- Standards:
 - To BS 5911-3 and BS EN 1917 and Kitemark certified; or
 - To BS 5911-4 and BS EN 1917.
- Manufacturer: Contractor's choice.
- Shape: Circular.
- Sizes: Refer to drawings 0042512-BHE-XX-XX-DR-C-3100.
- Cement type and content: To BS 5911-1 and BS EN 1916.
- Chamber sections:
 - Product reference: Contractor's choice.
 - Jointing type: Mortar.
- Cover slabs:
 - Product reference: Contractor's choice.
 - Thickness: Contractor's choice, submit for approval.
 - Loading grades to BS EN 124: refer to drawing 0042512-BHE-XX-XX-DR-C-3100.
 - Openings: To suit access covers.
- Steps: Required in chambers over 900 mm deep.
- Vortex flow control unit: Not required.

439 MANHOLE STEPS To all full access manholes

- Standard: To BS EN 13101.
- Type: D to Sewers for Adoption 8th Edition.
- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.
- Material: Galvanized steel.

444 SEALING FOR CONCRETE MANHOLES - BITUMINOUS STRIPS FW and SW manholes

- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.

446 SEALING FOR CONCRETE MANHOLES - MORTAR FW and SW manholes

- Manufacturer: Contractor's choice.

- Product reference: Contractor's choice.

448 SEALING FOR CONCRETE MANHOLES - SEALANT FW and SW manholes

- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.

471 ACCESS COVERS AND FRAMES - FOUL MANHOLES

- Standard: To BS EN 124.
- Types: Double seals and grease.
- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.
- Material: Refer to drawing 0042512-BHE-XX-XX-DR-C-3100
- Finishes: Refer to drawing 0042512-BHE-XX-XX-DR-C-3100.
- Sizes: Refer to drawing 0042512-BHE-XX-XX-DR-C-3100.
- Loading grades to BS EN 124: refer to drawing 0042512-BHE-XX-XX-DR-C-3100.
- Edging trims: Stainless steel.
- Accessories: n/a.

473 ACCESS COVERS AND FRAMES - PRECAST CONCRETE SEATINGS FW and SW manholes

- Standards: To BS 5911-3 and BS EN 1917 and Kitemark certified.
- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.
- Opening sizes: To suit access covers.

492 GEOTEXTILE MEMBRANES - FILTER

- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.

494 GEOTEXTILE MEMBRANES - IMPERVIOUS

- Manufacturer: Contractor's choice.
 - Product reference: Contractor's choice.

496 GRANULAR MATERIAL – NATURAL FW and SW pipe surrounds and beddings

- Standards: To Water Industry Specification WIS 4-08-02 (as amended by WIS 4-08-02A, 2008).
- Supplier : Contractor's choice.
- Recycled content: 50% (minimum) to BS EN ISO 14021.
- Size: Dependent on location – see Execution clauses in this section, and in sections R16, R17 and R18, if used.

497 GRANULAR MATERIAL – MANUFACTURED FW and SW pipe surround and beddings

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

498 GRANULAR SUB-BASE MATERIAL SW and FW pipe surrounds and beddings

- Standard: To Highways Agency Volume 1, 'Specification for Highway Works', Type 1 Unbound mixtures for sub-base.

- Recycled content: 50% (minimum) to BS EN ISO 14021.

6.4 EXECUTION

610 STRIPPING OUT

- Extent of stripping out: Abandoned existing drainage infrastructure within site boundary.
- Exposed ends of existing drainage to be abandoned: Seal with concrete.

611 EXISTING DRAINS

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

613 EXCAVATED MATERIAL

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

616 SELECTED FILL FOR BACKFILLING

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

623 LOWER PART OF TRENCH – GENERAL

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

625 LOWER PART OF TRENCH - TRANSITION DEPTH

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

631 TYPE OF SUBSOIL

- 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

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

641 PIPES AT DIFFERENT LEVELS IN COMMON TRENCH

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

- Pipes exceeding DN 700: 500 mm.

667 CLASS S SURROUND to pipes, bends and junction for clay and concrete - rigid pipes

- Type of subsoil: To be confirmed.
- Trench width up to 300 mm above crown of pipe (maximum):
 - DN 100 nominal pipe size: 600 mm.
 - DN 150 nominal pipe size: 700 mm.
 - DN 225 nominal pipe size: 800 mm.
 - DN 300 nominal pipe size: 900 mm.
- Granular material: Contractor's choice.
 - Sizes: To Water Industry Specification WIS 4-08-02 (as amended by WIS 4-08-02A, 2008).
- Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 50 mm for sleeve jointed pipes, 100 mm for socket jointed pipes. Where trench bottom is uneven, increase depth by 100 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing surround: Required.
- Surround:
 - Material: Granular.
 - Depth: To 50 mm above crown of pipe.
 - Compaction: By hand in 100 mm layers.
- Backfilling:
 - Material: Protective cushion of selected fill.
 - Depth: 150 mm (250 mm for adoptable sewers) above crown of pipe.
 - Compaction: By hand in 100 mm layers.

678 CLASS Z SURROUND FW and SW pipes

- Type of subsoil: To be confirmed.
- Blinding:
 - Material: Concrete.
 - Thickness (minimum): 25 mm.
 - Width: Full width of trench.
 - Allow to set before proceeding.
- Pipes:
 - Temporary support: Folding wedges of compressible board. Prevent flotation.
 - Clearance under pipes (minimum): 100 mm.
 - Adjust pipes to line and gradient.
- Initial testing before placing surround: Required.
- Surround:
 - Material: Concrete.
 - Depth: To 150 mm above crown of pipe.
 - Width: Full width of trench.
- Vertical construction joints:
 - Location: At face of flexible pipe joints.
 - Material: 18 mm thick compressible board precut to profile of pipe.
 - Socketed pipes: Fill gaps between spigots and sockets with resilient material to prevent entry of concrete.

680 CONCRETE SURROUND FOR PIPE RUNS NEAR FOUNDATIONS

- Class Z surround: Provide in locations where bottom of trench is lower than bottom of foundation and as follows (horizontal clear distance between nearest edges of foundations and pipe trenches):
 - Trenches less than 1 m from foundations: Top of concrete surround not lower than bottom of foundation.
 - Trenches more than 1 m from foundations: Top of concrete surround not lower than D mm below bottom of foundation, where D mm is horizontal distance of trench from foundation, less 150 mm.

683 LAYING PIPELINES

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

685 JOINTING PIPELINES

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

687 CONCRETE SURROUND FOR CROSSOVERS

- Class Z surround: Provide where two pipelines (other than plastics pipes) cross with less than 300 mm separation.
 - 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

- 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.
 - Distance to rocker pipe from structure (maximum): 150 mm.
- Provision for movement for pipelines that need not be cast in or fixed to structures (e.g. walls to footings):
 - Rocker pipes as specified above; or
 - 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.

691 BENDS AT BASE OF SOIL STACKS

- Type: Nominal 90° rest bends.
 - Radius to centreline of pipe (minimum): 200 mm.
- Height of invert of horizontal drain at base of stack below centreline of lowest branch pipe (minimum): 450 mm.
- Bedding: Do not impair flexibility of pipe couplings.
 - Material: Concrete.

695 BACKDROP PIPES OUTSIDE MANHOLE WALLS

- Excavation beneath backdrop pipe: Backfill.
 - Material: Concrete.
- Pipe encasement:.
 - Material: Concrete.
 - Thickness (minimum): 150 mm.

697 INSTALLING FLEXIBLE COUPLINGS

- Ends of pipes to be joined: Cut cleanly and square.
- 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.
- Clamping bands: Tighten carefully to make gastight and watertight seals.

699 CONNECTIONS TO SEWERS

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

705 INITIAL TESTING OF PIPELINES

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

711 TRENCH SUPPORTS

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

715 BACKFILLING TO PIPELINES

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

718 BACKFILLING OVER CONCRETE

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

720 BACKFILLING UNDER ROADS AND PAVINGS

- 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

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

728 LAYING WARNING MARKER TAPES

- Installation: During backfilling, lay continuously over pipelines.
- Depth: 300-400 mm.
 - Pipelines deeper than 2 m: Lay an additional tape 600 mm above the top of the pipeline.

732 TEMPORARY BRIDGES

- Trench bridges: As necessary to prevent construction traffic damaging pipes after backfilling.

736 INSTALLING RODDING POINTS

- Bedding and surround:
 - Material: Concrete.
 - Thickness (minimum): 150 mm..
- Permissible deviation in level of external covers and gratings: +0 to -6 mm.

741 INSTALLING INSPECTION CHAMBERS - PLASTICS

- Bedding:
 - Material: Concrete.
 - Thickness (minimum): 150 mm.
- Surround:
 - Material: Concrete.
 - Thickness (minimum): 150 mm.
- Backfilling: Selected fill.
 - Compaction: By hand in 100 mm layers.
- Concrete collar:
 - Material: Concrete.
 - Thickness (minimum): 200 mm.
 - Width (minimum): 200 mm.
- Seating: Brickwork as section F10.

743 INSTALLING CONCRETE MANHOLES

- Bases:
 - Material: Concrete.
 - Thickness (minimum): 225 mm.
- Surround:
 - Material: Concrete.
 - Thickness (minimum): 150 mm.
 - Height: Full height.
- Backfilling:
 - Material: Selected fill.
 - Compaction: By hand in 100 mm layers.

753 FIXING MANHOLE STEPS

- Fixing: Secure to chamber wall.
- Positioning: 300 mm vertical centres staggered 300 mm horizontally, with lowest step 300 mm (maximum) above benching and top step 450 mm (maximum) below top of cover.

755 JOINTING CONCRETE MANHOLE CHAMBER SECTIONS

- Jointing and sealing: Mortar or other material to SfA 8th Edition.
- Inner joint surface: Trim surplus jointing material extruded into chamber and point neatly.

757 LAYING CONVENTIONAL CHANNELS, BRANCHES AND BENCHING

- Main channel: Bed solid in 1:3 cement:sand mortar.

- 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.
- Branches greater than nominal size 150 mm: Connect the branch soffit level with the main drain soffit.
- Connecting angles more than 45° to direction of flow: Use three-quarter section channel bends.
- Benching:
 - Material: Concrete.
 - 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.
 - Topping:
 - Material: 1:3 Cement:sand mortar.
 - Application: Before benching concrete has set, and with dense smooth uniform finish.

759 LAYING PREFORMED PLASTICS CHANNELS, BRANCHES AND BENCHING

- Main channel: Bed solid in 1:3 cement:sand mortar.
 - 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.
 - Connecting angles more than 45° to direction of flow: Use three-quarter section channel bends.
- Bedding: 1:3 cement:sand mortar. Use clips or ensure adequate mechanical key.
- Benching:
 - Material: Concrete.
 - 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.
 - Topping:
 - Material: 1:3 Cement:sand mortar.
 - Application: Before benching concrete has set, and with dense smooth uniform finish.

761 LAYING SEALED ACCESS FITTINGS, BRANCHES AND BENCHING

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

773 INSTALLING ACCESS COVERS AND FRAMES

- Seating: Precast concrete.
- Bedding and haunching of frames: Continuously.
 - Material: 1:3 cement:sand mortar.
 - Top of haunching: 30 mm below surrounding surfaces.
- Horizontal positioning of frames:
 - Centred over openings.
 - Square with joints in surrounding paving.
- Vertical positioning of frames:
 - Level; or
 - Marry in with levels of surrounding paving.

- Permissible deviation in level of external covers and frames: +0 to -6 mm.

776 EXPOSED OPENINGS IN INSPECTION CHAMBERS, ACCESS POINTS, FITTINGS AND EQUIPMENT

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

6.5 COMPLETION

901 REMOVAL OF DEBRIS AND CLEANING

- Preparation: Lift covers to manholes, inspection chambers and access points. Remove mortar droppings, debris and loose wrappings.
 - Timing: Before cleaning, final testing, CCTV inspection if specified, and immediately before handover.
- 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.
- Washings and detritus: Do not discharge into sewers or watercourses.
- Covers: Securely replace after cleaning and testing.

903 TEMPORARY MEASURES

- Water used to stabilize tanks and the like during installation: Drain.

911 TESTING AND INSPECTION

- Dates for testing and inspection: Give notice.
 - Period of notice: 7 days.

921 FINAL TESTING OF PRIVATE GRAVITY DRAINS AND SEWERS UP TO DN 300

- Before testing:
 - Cement mortar jointing: Leave 24 h.
 - Solvent welded pipelines: Leave 1 h.
- Standard: To Building Regulations.
- Method: Contractor's choice.

931 FINAL TESTING OF ADOPTABLE AND LARGE PRIVATE SEWERS

- Standard (sewers up to and including size DN 750):
 - England, Wales and Northern Ireland: To WRc 'Sewers for adoption'.
 - Scotland: To WRc 'Sewers for Scotland'.
- Method: Contractor's choice.

941 WATER TESTING OF MANHOLES AND INSPECTION CHAMBERS

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

971 CCTV INSPECTION OF PRIVATE PIPELINES

- General: Carry out and record internal inspection using CCTV equipment.
 - Locations to be inspected: Foul and surface water drains.
- Illumination: Of adequate intensity.
- Recording: Provide continuous position recording, still photographs and stopping of the camera at any point.

- Copy of videotape recording: Submit.

976 CCTV INSPECTION OF ADOPTABLE PIPELINES

- General: Permit the Adopting Authority or its agent to carry out and record internal CCTV inspection of pipelines and associated manholes after completion.
 - Locations to be inspected: Adoptable foul and surface water sewers.
- Pipelines under highways: Complete construction, except for laying of wearing course, before inspection.

978 LIFTING KEYS

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

980 INSTRUCTIONS

- Manufacturer's user instructions: Submit as per client requirements.

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