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44 Gloucester Avenue  
London, NW1 8JD

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## Specification for Below Ground Drainage

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Job number. 211593  
Revision: C2  
Status: FINAL CONSTRUCTION  
Date: May 2019

## Document Control

		remarks:	Issued for Stage D				
revision:	P1	prepared by:	Christopher Davies	checked by:	Paul Chance	approved by:	Paul Chance
date:	April 2016	signature:		signature:		signature:	

		remarks:	Issued for Tender – Stage 4				
revision:	T1	prepared by:	Christopher Scott	checked by:	T1	approved by:	Christopher Davies
date:	July 2016	signature:	CSc	signature:	July 2016	signature:	

		remarks:	Issued for Construction				
revision:	C1	prepared by:	Christopher Davies	checked by:	Paul Chance	approved by:	Paul Chance
date:	Feb 2017	signature:		signature:		signature:	

		remarks:	Issued for Final Construction				
revision:	C2	prepared by:	Will Hudson	checked by:	Tim Kenning	approved by:	Tim Kenning
date:	May 2019	signature:	WHu	signature:	TKe	signature:	TKe

## R Disposal systems

### R12 Below ground drainage systems

To be read with Preliminaries/ General conditions.

#### GENERAL

##### 110 BELOW GROUND DRAINAGE SYSTEM (Gravity)

- Surface water and rainwater drainage sources:
  - One piece gullies and covers;
  - Rainwater downpipes (nonsiphonic), as section R10;
- Foul drainage sources: Sanitary appliances, as section N13, Floor Drains as section R11 and Discharge Stacks as section R11.
- Land drainage sources: None.
- Pressure relief drainage sources: None.
- Pipes, bends and junctions:
  - Cast iron - ductile;
  - Clay - flexible joints;
  - Plastics - structured wall; and
  - Accessories: Refer to Clauses 352 to 379.
- Manholes, inspection chambers, traps, and separators: Refer to Clauses 401 to 421.
- Accessories: Refer to Clauses 433 to 444.
- Disposal:
  - To pumping stations, as section R18; and
  - To sewers;
- Accessories – general: Refer to Clauses 433 to 444.

##### 135A PRIVATE PACKAGED PUMPING STATIONS AND PRESSURE PIPELINE SYSTEM (Foul)

- Foul drainage sources: Below ground pipelines.
- Private packaged pumping stations: As section R18.
  - Control panel type: As section R18.
  - Accessories: Access covers and frames
- Pressure pipes, bends and junctions: As per manufacturer requirements.
  - Accessories: Anchorages, as section R18.
- Disposal: Below ground foul drainage pipelines.

**PRODUCTS****311 ADAPTORS TO CLAY DRAINAGE.**

- Material and standard: Polypropylene to BS EN 295-1 and Kitemark certified.  
Type:
  - DN 32 waste pipe to DN 100 clay;
  - DN 68 rainwater pipe to DN 100 clay;
  - DN 100 discharge stack to DN 100 clay; and
  - DN 100 rainwater pipe to DN 100 clay.
- Manufacturer: Wavin, Hepworth or similar approved.  
Product reference: As per chosen Manufacturer's reference.

**312 ADAPTORS TO PLASTICS DRAINAGE.**

- Material and standard: Plastics to BS 4660 and Kitemark certified or to BS EN 1401-1 and Kitemark certified.
- Type:
  - DN 32 waste pipe to DN 100 plastics;
  - DN 68 rainwater pipe to DN 100 plastics;
  - DN 100 discharge stack to DN 100 plastics; and
  - DN 100 rainwater pipe to DN 100 plastics.
- Manufacturer: Wavin, Hepworth or similar approved.  
Product reference: As per chosen Manufacturer's reference.

**315A ONE PIECE GULLIES AND COVERS (Yard Gully)**

- Standards: To BS EN 295-1 and Kitemark certified, or Agrément certified.
- Material: Clay.
- Manufacturer: Hepworth or similar approved.
  - Product reference: RGP6.
- Sizes: 291x291mm.
- Outlet sizes: 100mm.
- Covers: Medium Duty Grid.
  - Material: Metal.
- Silt buckets: Hepworth.
  - Product reference: IBP3.

**315B ONE PIECE GULLIES AND COVERS (Paved Area Gully)**

- Standards: To BS EN 295-1 and Kitemark certified, or Agrément certified.
- Material: Clay.
- Manufacturer: Hepworth or similar approved.
  - Product reference: SDG2/1.
- Sizes: 168x168mm.
- Outlet sizes: 100mm.
- Covers: SDG2/5. (to be confirmed by architect)  
Material: Metal.

**317B COMPOSITE GULLIES (Floor Gully - Vertical Outlet)**

- Standards: To BS EN 1561.
- Material: Cast Iron.
- Manufacturer: Wade similar approved.
- Product reference: G304
- Raising pieces:
  - Product reference: Wade - to suit levels.
- Grating:
  - Product reference: Wade K23 series, stainless steel (to be confirmed by architect)
- Appropriate adaptor to suit below ground drainage system to be used

- 329 PIPES, BENDS AND JUNCTIONS - SUPPLY
- Pipes and fittings: From same manufacturer for each pipeline.
- 332 PIPES, BENDS AND JUNCTIONS - CAST IRON - DUCTILE Foul or surface water
- Standard: To BS EN 598, Kitemark certified.
  - Manufacturer: Saint Gobain or similar approved.
    - Product reference: Timesaver or similar approved.
  - Sizes: DN 100 and DN 150.
  - Additional corrosion protection: None.
  - Jointing type: Standard Ductile iron coupling with stainless steel nuts and set screws and synthetic rubber gasket .
- 336 PIPES, BENDS AND JUNCTIONS - CLAY - FLEXIBLE JOINTS.
- Material and standard: Vitrified clay to BS EN 295-1, Kitemark certified.
  - Manufacturer: Hepworth or similar approved.
    - Product reference: As per chosen Manufacturer's reference.
  - Sizes:
    - DN 100;
    - DN 150;
    - DN 225; and
    - DN 300.
  - Crushing strength (minimum): FN 40.
  - Jointing type: Polypropylene sleeve.
- 344 PIPES, BENDS AND JUNCTIONS - PLASTICS - STRUCTURED WALL (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: Rigidrain.
  - Recycled content: 50% (minimum) to BS EN ISO 14021.
  - Sizes: DN 255.
  - Jointing type: Spigot and socket.
- 346 PIPES, BENDS AND JUNCTIONS - PVC-U - SOLID WALL.
- Standard: BS EN 1401-1 with flexible joints.
  - Class: SN4.
  - Manufacturer: Osma or similar approved.
    - Product reference: OsmaDrain or similar approved.
  - Recycled content: minimum 50%
  - Sizes: DN 100 and DN 160.
  - Application area code: UD.
- 357 CONNECTORS - SADDLE.
- Standards:
    - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
    - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
    - Concrete: To BS 5911-6 and Kitemark certified, or Agrément certified.
    - Plastics: To BS 4660 and Kitemark certified, BS EN 13598-1 or Agrément certified.
  - Material: As existing.
  - Manufacturer: Hepworth or Saint Gobain or similar approved.
    - Product reference: As pipe materials in this specification.
  - Sizes: As required.

**359 FLEXIBLE COUPLINGS.**

- Standard: To BS EN 295-4 or WIS 4-41-01 and Kitemark certified, or Agrément certified.
- Manufacturer: As pipe manufacturer.
  - Product reference: As per pipe manufacturer installation requirements.

**365 PUDDLE FLANGES (In basements)**

- Manufacturer: St Gobain.
  - Product reference: Flange - TD777 or similar approved.

**371 RODDING POINTS**

- Standards:
  - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
  - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
  - Concrete: To BS 5911-6 and Kitemark certified, or Agrément certified.
  - Plastics: To BS 4660 and Kitemark certified, to BS EN 13598-1 or Agrément certified.
- Material: To match pipe material.
- Manufacturer: To match pipe material or similar approved.
  - Product reference: As per chosen Manufacturer's reference.
- Sizes: Refer to drawings.

**379 WARNING MARKER TAPES For external drainage runs**

- Type: Heavy gauge polyethylene.
- Manufacturer: Contractors Choice.
  - Product reference: Contractors Choice.
- Colour: Red with black letters.
- Widths: 100mm and 150mm.
- Message: Foul sewer below or surface water sewer below.
- Wire detection aid: Not required.

**401 INSPECTION CHAMBERS - PLASTICS.**

- Standard: To BS EN 13598-1, BS EN 13598-2 or Agrément certified.
- Diameter: 450 or 475mm diameter.
- Manufacturer: Hepworth or similar approved.
- Bases:
  - Product reference: PPIC.
- Shaft units:
  - Product reference: PPIC.
- Access covers and frames:
  - Product reference: Refer to manhole schedules.
  - Loading grades to BS EN 124: Refer to manhole schedules.

**407 MANHOLES AND INSPECTION CHAMBERS - CONCRETE.**

- Standards:
  - To BS 5911-3 and BS EN 1917 and Kitemark certified; or
  - To BS 5911-4 and BS EN 1917.
- Manufacturer: CPM Group Limited or similar approved.
- Shape: Refer to manhole schedules.
- Sizes: Refer to manhole schedules.
- Cement type and content: To BS 5911-1 and BS EN 1916.
- Chamber sections:
  - Product reference: Refer to manhole schedules.
  - Jointing type: Bituminous Strips.
- Cover slabs:
  - Product reference: CPM Ground Limited or similar approved.
  - Thickness: 150mm.
  - Loading grades to BS EN 124: Refer to manhole schedules.
  - Openings: To suit access covers.
- Steps: Refer to clause 439.
- Vortex flow control unit: Refer to drawings and manhole schedules.

**433 MANHOLE CHANNELS AND BRANCHES - CONVENTIONAL.**

- Material: Clay.
- Manufacturer: Hepworth or similar.
  - Product reference: Channels.

**435 MANHOLE CHANNELS AND BRANCHES - PREFORMED PLASTICS.**

- Manufacturer: Osma
  - Product reference: OsmaDrain.

**439 MANHOLE STEPS.**

- Standard: To BS EN 13101.
- Type: D.
- Manufacturer: Contractors Choice.
  - Product reference: Contractors Choice.
- Material: Galvanized steel.

**444 SEALING FOR CONCRETE MANHOLES - BITUMINOUS STRIPS.**

- Manufacturer: Denso or similar approved.
  - Product reference: Tokstrip.

**464 MODULAR STORMWATER ATTENUATION UNITS (External to Buildings).**

- Manufacturer: SDS or equivalent approved.
  - Product reference: Geolight – load rating to suit construction traffic
- Unit size: Refer to drainage drawings.
- Tank capacity/ size (minimum): Refer to drainage drawings.

**471 ACCESS COVERS AND FRAMES.**

- Standard: To BS EN 124.
- Types: Refer to manhole schedules.
- Manufacturer: Manhole Cover Ltd or similar approved.
  - Product reference: Refer to manhole schedule.
- Material: Refer to manhole schedule.
- Finishes: Refer to manhole schedule.
- Sizes: Refer to manhole schedule.
- Loading grades to BS EN 124: Refer to manhole schedule.
- Edging trims: Refer to Landscape Architect specification.
- Accessories: Refer to manhole schedule.

**483 CONCRETE (General)**

- Standard: To BS 8500-2.
- Concrete: GEN3 designed to BRE special digest 1 concrete in aggressive ground.

**498 GRANULAR SUB-BASE MATERIAL.**

- Standard: To Highways Agency Volume 1, 'Specification for Highway Works', Type 1 Unbound mixtures for sub-base.
- Recycled content: allowable to BS EN ISO 14021.

**EXECUTION****610A STRIPPING OUT**

- Extent of stripping out: refer to drainage drawings.
- Exposed ends of existing drainage to be abandoned: In accordance with Building Regulations Part H section B17, B18 and B19.

**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.

**667A CLASS S SURROUND Typical granular surround when special pipe surround is not required**

- Type of subsoil: refer to site investigation report.
- Trench width up to 300 mm above crown of pipe (maximum):
  - DN 100 nominal pipe size: 550 mm.
  - DN 150 nominal pipe size: 600 mm.
  - DN 225 nominal pipe size: 700 mm.
  - DN 300 nominal pipe size: 750 mm.
  - DN 450 nominal pipe size: 1150 mm.
  - DN 600 nominal pipe size: 1350mm
- Granular material
  - Sizes:
    - Pipe sizes DN100 and DN150: Size 4/10
    - Pipes sizes DN225 and DN300: Size 4/10, 10/20 or 4/20
    - Pipe sizes DN375-500: Size 10/20 or 4/20
    - Pipe sizes DN600 and above: Size 10/20, 20/40, 4/20 or 4/40
- Bedding:
  - Material: Granular, compacted over full width of trench.
  - Thickness (minimum): 150mm
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing surround: Air (method L).
- Surround:
  - Material: Granular.
  - Depth: To 150 mm above crown of pipe.
  - Compaction: By hand 100mm layers.
- Backfilling:
  - Material: Protective cushion of selected fill.
  - Depth: 150 mm above pipe surround.
  - Compaction: By hand in 100 mm layers.

**673A CLASS W SURROUND** (For pipes where cover from underside of slab is more than 300mm)

- Type of subsoil: Refer to site investigation report.
- Timing: Excavate trench after hardcore has been laid and compacted.
- Granular material:
  - Pipe sizes DN 100 and DN 150: Size 4/10
  - Pipe sizes DN 225 and DN 300: Size 4/10 or 10/20
- Bedding:
  - Material: Granular, compacted over full width of trench.
  - Thickness (minimum): 150 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing surround: Air (Method L).
- Surround:
  - Material: Granular.
  - Depth: To 150 mm above crown of pipe.
  - Compaction: By hand.
- Backfilling:
  - Material: Hardcore as section D20, or granular.
  - Depth: Up to slab formation.
  - Compaction: In 300 mm (maximum) thick layers.

**676A CLASS Y SURROUND** (Where pipes are to be cast integrally with the slab where underside of slab to pipe soffit is less than 300mm)

- Type of subsoil: refer to site investigation report.
- Timing: Excavate trench after hardcore has been laid and compacted.
- 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): 150 mm.
  - Adjust pipes to line and gradient.
- Initial testing before placing surround: Air (Method L).
- Surround, cast integrally with slab:
  - Material: Concrete of same mix as slab.
  - Width (minimum): External diameter of pipe plus 200 mm.
- Extent of surround: To within 150 mm of nearest flexible joint.

**678A CLASS Z SURROUND** (Where cover to soffit of pipeline is less than 1.2m under roads, 0.9m under non-trafficked areas and 0.6m under soft landscaped areas)

- Type of subsoil: refer to site investigation report.
- 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): 150 mm.
  - Adjust pipes to line and gradient.
- Initial testing before placing surround: Air (Method L).
- 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.

**687A CONCRETE SURROUND FOR CROSSEOVERS**

- Class Z surround: Provide where two pipelines 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): 450mm where .
- Bedding: Do not impair flexibility of pipe couplings.
  - Material: Concrete.

**693A DIRECT CONNECTION OF GROUND FLOOR WCS TO DRAINS**

- Drop from crown of WC trap to invert of drain (maximum): 1.3 m.
- Horizontal distance from the drop to a ventilated drain (maximum): 12 m.

**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.

**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.

**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.

**734 INSTALLING ACCESS POINTS AND GULLIES**

- Bedding:
  - Material: Concrete.
  - Thickness (minimum): 150 mm.
- Surround:
  - Material: Concrete.
  - Thickness (minimum): 150 mm.
  - Height: Full height.
- Backfilling:
  - Material: Selected fill.
  - Compaction: By hand in 100 mm layers.
- Setting out relative to adjacent construction features: Square and tightly jointed.
- Permissible deviation in level of external covers and gratings: +0 to -6 mm.
- Raising pieces (clay and concrete units): Joint with 1:3 cement:sand mortar.
- Exposed openings: Fit purpose made temporary caps. Protect from traffic.

**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: Refer to drainage drawings.
  - Thickness (minimum): 150mm.
- Surround:
  - Material: Refer to drainage drawings.
  - Thickness (minimum): 150mm.
- Backfilling: Selected fill.
  - Compaction: By hand in 100 mm layers.
- Concrete collar:
  - Material: Refer to drainage drawings.
  - Thickness (minimum): Refer to drainage drawings.
  - Width (minimum): Refer to drainage drawings.
- Seating: as required.

**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: Bed in joints.
- 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: Refer to Clause 444.
- 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: Concrete.
    - 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: Concrete.
    - 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: Concrete.
    - Application: Before benching concrete has set, and with dense smooth uniform finish.

**766 INSTALLING UNDERGROUND STORAGE TANK UNITS**

- Base:
  - Material: Concrete.
  - Thickness (minimum): 225 mm.
- Stabilizing: Before placing surround, fill with water to Neck of tank.
- Surround:
  - Material: Concrete.
  - Thickness (minimum): 150 mm.
  - Height above top of base: Full height of tank.
- Backfilling to upper part of tank: Selected fill.
  - Compaction: By hand in 100 mm layers.

**771 INSTALLING OUTFALLS**

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

**773 INSTALLING ACCESS COVERS AND FRAMES**

- Seating: refer to drawings.
- 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.

## 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: As required by Building Inspector.

### 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.

### 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.

### 978 LIFTING KEYS

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



## R18 Pumping stations and pressure pipelines

**To be read with Preliminaries/ General conditions.**

### PRODUCTS

- 305 BELOW GROUND DRAINAGE SYSTEMS - PRODUCTS
- Generally: As section R12.
- 310 PRIVATE PACKAGED PUMPING STATIONS
- Manufacturer: Refer to drainage drawings.
    - Product reference: Refer to drainage drawings.
  - Pump impeller type: Vortex.
  - Backup pump system: Required.
  - Non-return valve: Required.
  - Outlet pressure pipe:
    - Material: To suit pumping station manufacturer requirements.
    - Size: To suit pumping station manufacturer requirements.
  - Access covers and frames: As section R12.
    - Loading to BS EN 124: B125
  - Accessories: Additional equipment and fittings necessary to complete the installation, including safety covers and chains, access equipment and tools.
- 320A PRESSURE PIPES, BENDS AND JUNCTIONS - MDPE
- Standard: To BS EN 12201-1, -2 and -3, Kitemark certified..
    - Pipe standard dimension ratio (SDR): SDR 17.
  - Manufacturer: Contractor's choice.
    - Product reference: Contractor's choice.
  - Colour: Black.
  - Sizes: To suit pumping station manufacturer requirements.
  - Jointing type: Electrofusion.
- 330 PRESSURE PIPES, BENDS AND JUNCTIONS - PVC-U
- Standards: To BS 3505, Kitemark certified, and BS 4346-1 or to BS EN ISO 1452-1 to -5.
  - Manufacturer: Contractors choice.
    - Product reference: Contractors choice.
  - Pressure rating: To suit pumping station manufacturer requirements.
  - Colour: Black.
  - Sizes: To suit pumping station manufacturer requirements.
  - Jointing: Solvent welded.

### EXECUTION

- 605 BELOW GROUND DRAINAGE SYSTEMS - EXECUTION
- Generally: As section R12.
- 620B INSTALLING PRIVATE PACKAGED PUMPING STATIONS (Basements)
- Pumping station to be installed in reinforced concrete box to structural engineer's detail
  - Puddle Flanges are to be used on all pipe penetrations
  - Void between chamber wall and R/C box to be infilled with concrete

**630 ANCHORAGES TO PRESSURE PIPELINES**

- Horizontal thrusts: Cast concrete cradle around half of pipe up to undisturbed trench side.
- Vertical or inclined thrusts: Clamp pipeline/ fitting to concrete block below with two 6 mm galvanized steel straps.
- Pipeline inclines greater than 16.5%: Cast concrete blocks across pipe and set blocks into undisturbed ground.

**COMPLETION**

**910 WATER TESTING OF PRIVATE PRESSURE PIPELINES**

- Standard: To BS EN 805.
  - Polyethylene pipes: Also in accordance with WRc 'Guide to testing of water supply pipelines and sewer rising mains'.
- Timing: 24 hours (minimum) after completion of joints and installation of anchorages.
- Completion: Commission pumping system, and check that operation of complete installation is satisfactory under normal working conditions