Belowground Drainage Specification

TO BE READ IN CONJUNCTION WITH THE STANDARD PRELIMINARIES DOCUMENT

THIS IS NOT A STANDALONE DOCUMENT

Revision C1 - 09/08/2019 – Construction

PROJECT REVISION SHEET

BELOW GROUND DRAINAGE SPECIFICATION

To be read in conjunction with the Trade Contract Preliminaries.

Rev.	Section	Change
C1		Construction

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R12 – DRAINAGE BELOW GROUND [50-10-15]

PERFORMANCE OBJECTIVES

To provide an effective and efficient means of conveying foul water under gravity where possible away from the building to the private sewer connections.

To provide an effective and efficient means of conveying foul water via a pumping station, away from the building to the private sewer connections.

To provide an effective and efficient means of conveying surface water from the roof downpipes and areas of hardstanding on the site under gravity away from the building and discharge it to a new the soakaway installation.

To provide sealed access points, connections and joints to prevent the release of foul air from pipework

To limit the potential for flooding and damage to areas within or outside of the building during and after periods of heavy rain.

To investigate existing surface water BG drainage.

To minimise the risk of blockages and leakages.

To provide access for the clearing of blockages and to ensure that the system can be adequately tested, cleaned and maintained.

To ensure pipework back falls do not develop due to differential settlement.

To achieve self-cleaning velocities.

To ensure that adequate pipework flexibility is provided at manholes, building structure, movement joints, etc.

To repair existing drains in situ.

To deal safely with deep excavations during construction.

To be safe, reliable and efficient in operation.

This specification is to be read in conjunction with the main contract preliminaries.

To ensure that all drainage pipe penetrations through the concrete walls, floors and chambers are fitted with puddle flanges to minimise ground water ingress.

DESIGN PARAMETERS

The complete installation must comply with the requirements of the following documents:

- The Building Regulations Approved Document H
- BS 8301:1985 Code of Practice for Building Drainage

- BS8000:Part14:1987 - Workmanship on building sites. Code of practice for below ground drainage
- BS EN 12056 Parts 1-5 – Gravity Drainage Systems inside Buildings
- BS EN 752:2008 - Drain and sewer systems outside buildings
- BS EN 1295-1:1997 - Structural design of buried pipelines under various conditions of loading. General requirements
- BS EN 1610:2015 - Construction and testing of drains and sewers
- BS8582:2013 Code of practice for surface water management for development sites
- and all other relevant British Standards.
- Local Authority and other Statutory Requirements
- Sewers for adoption 6th edition
- Sewers for adoption 7th edition
- Manufacturer's installation instructions;
- CIBSE Guide G: Public Health and Plumbing Engineering 2014
- BRE Digest 365 – Soakaway Design
- The Health and Safety at Work Act 1974;
- Health and Safety Executive (HSE) Directives and other requirements;
- Department for Transport, Local Government and the Regions (2001). Planning Policy Statement (PPS), Note 25: Development and Flood Risk.
- Building Research Establishment (1991). BRE Digest 365, Soakaway Design.
- Construction Industry Research and Information Association (1995) CIRIA Report 156 Infiltration Drainage - Manual of Good Practice.
- Construction Industry Research and Information Association (2015) The SUDS Manual (C. 753).
- Other relevant CIRIA Guidance
- Rainfall runoff management for developments Report SC030219 (Flood and Coastal Erosion Risk Management Research and Development Programme - DEFRA & Environment Agency)
- Clay Pipe Development Association publications, where applicable

A copy of the relevant standards and the pipework manufacturers catalogue will be kept on site at all times.

System life - in excess of 50 years. In situ repairs to existing pipes to have a root intrusion guarantee in excess of 10 years.

SYSTEM DESCRIPTION

A new below-ground drainage system serving the building is required to serve both the retained and new build elements, and to provide surface water drainage from new and existing elements of the building, as well as the surrounding landscaped areas.

The below-ground drainage system shall be designed to keep the surface water and the foul water systems separate. All surface water drainage is to discharge via the new soakaway installation.

Provide all below ground drains, pumping stations, manholes, road gullies, yard gullies, floor and

threshold gullies and sockets for connection of above ground drainage.

Existing drainage
All drainage routes within a 45 degree line down from existing building elements are to be drawn up with the proposed method of excavation indicated on the drawing. This is to be forwarded to the Structural Engineer, the CA and the Building Services Engineer to confirm methodology is satisfactory in order to ensure that the proposals will not undermine adjacent structures.

Before starting work, check invert levels and positions of all previously installed drains, sewers, fittings and chambers against information shown on the drawings and schedules and report any discrepancies. Adequately protect previously installed drains and manholes.

Remove all redundant remnants of the existing below ground drainage system.

Protect all elements that are to be reused and ensure that they remain in good working order.

Allow to jet and descale any sections of the existing drainage to be reused. Allow to reline the drainage where indicated on drawings.

Adequately protect existing drains and maintain normal operation during construction.

Foul Water Drainage via gravity
The extent and levels of the existing drainage system is shown on the System Drawings.

The contractor is to design, supply, install and test a complete foul water below ground drainage installation to collect the foul drainage from the buildings and discharge it by gravity where possible to the existing drainage infrastructure.

Surface Water Drainage via gravity
The extent and levels of the existing drainage system is shown on the System Drawings.

~~Threshold channel drains are provided outside each exit point at ground floor level.~~ REV C1

The contractor is to design, supply, install and test a complete surface water below ground drainage installation is to collect the surface water from the building roofs and hardstanding on the site and discharge it by gravity to a new soakaway installation.

Soakaway

A Soakaway test was carried out in the vicinity of the new soakaway by Southern Testing in May 2016 (Project Reference P0851). The contractor should refer to this report which will be made available on request. The existing ground conditions are summarised below:

Depth	Thickness	Soil Type	Description
GL to 1.0m/1.2m	1.0m to 1.2m	Made Ground	Made Ground soils arising from backfilled Archaeological pit comprising reworked orange brown clay, brick fragments, ashy material and occasional clinker.
1.0m/1.2m to 1.4m	0.2m to 0.4m	Clay	Stiff, orange brown CLAY
1.4m to 1.8m/2.0m	0.4m to 0.6m	Clayey Gravel	Orange brown clayey fine to coarse flint GRAVEL.
1.8m/2.0m to 3.0m/5.5m+	1.0m to 3.7m+	Sand	Pale yellowish orange fine SAND.

The new soakaway installation is to be based on the Polypipe Polystorm system and comprises of:

- Polystorm Cells wrapped in a permeable Geotextile membrane to provide a volume of 158m^3 with 1.2m total cell height.
- RIGISTORMSeparate chamber with silt trap.
- Air ventilation pipework.
- Overflow pipework to the surface water sewer.
- Proprietary flange adaptors to Geotextile membrane.
- The design should allow for limited traffic loading.

The soakaway depth is beneath the 2.3m recommendation for loading and soil type and special measures will be required during installation with either mass concrete backfill or reinforced soil backfill to the bottom 700mm surround to the Polystorm Cells.

The installation is to be in accordance with the Polypipe Polystorm standard details and recommendations.

Foul Water Pumping

The contractor is to design, supply, install and test a complete foul water pumping installation to collect the foul drainage from the buildings and discharge it to the existing drainage infrastructure.

Rising mains shall rise to above finished ground level before entering the aboveground drainage system.

The foul water pumping station is to consist of:

- Vertical GRP chamber with stub pipes to suit the incoming drainage pipes as shown on the System Drawings, cable duct and 7.4m^3 attenuation storage for 24 hours.
- Vent stub pipe.
- Duplex heavy duty drainage pumps (80mm solids handling and 100mm suction) with lifting chain. Foul drainage from public and office WCs, showers and commercial kitchens. Flow rates, pipe lengths and lift heights are shown on the System Drawings.
- 3 phase motors.
- Duckfoot bends with quick release self-locating couplings with guiderail to top of the chamber.
- 80mm ductile iron pipework with non-return valves and a single gate valve in the horizontal.
- Float/electrode level controls and 10m meters of cable (cable length to be confirmed prior to order). IP54 sheet steel auto-changeover control panel with volt free contacts for remote alarms to BMS.
- Deliver to site with installation and commissioning in a single visit after the chamber has been installed by the Trade Contractor.
- Unloading at site, cable containment between pump and control panel, provisions of mains power to panel and all connecting pipe work by the Trade Contractor.

A quotation has been obtained from New Hayden Pumps: P-171610 A2. Any alternative proposal to be equivalent to this quotation. Contact Gary Warman ph.01277 366 763. Email. Gary.warman@NHPumps.com.

Pipework, Fittings and Equipment

All below ground drainage pipework outside the building footprint is to be in ~~vitrified clay~~ uPVC to BS EN 1401. Install as per Building Regulations Part H Diagram 10

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All below ground drainage pipework within the building footprint (underslab) is to be grey iron to BS EN 877.

Connect between pipes of different materials using adaptors recommended by the pipe manufacturers.

Before starting work, check invert levels and positions of all existing drains and manholes against information shown on the drawings and report any discrepancies.

Pipes which run under the building shall be encased in concrete and suspended from the slab to the Structural Engineers requirements and System Drawings.

Any pipes outside the building which have less than 600mm cover, or which run close to the building foundations (as defined in BS 8301) shall be protected with a concrete surround as shown in the detail drawings. Provide flexible joints in the concrete surround at connections to gullies, manholes etc. and at not less than 4m centres.

General bedding for pipes which do not run under the building or which do not run close to building foundations and which have more than 600mm cover shall be Class S.

Ensure each complete assembly of fittings, traps, etc., including appropriate couplings, is procured from a common manufacturer. Check compatibility components with each other and with the pipe system.

Install marker tapes above all new drainage pipes.

Rocker Pipes
Provide rocker pipes with flexible joints at entry/exit to manholes or underground chambers, for pipes passing through or under foundations or walls and as shown on the detail drawings, and wherever pipes:

- emerge from being encased in mass concrete below the ground floor slab
- enter or leave an internal manhole or other structure
- either side of any ground beams
- wherever external below ground drainage leaves the building perimeter
- wherever external below ground drainage passes from being encased in mass concrete to being encased in pea shingle.

Install compressible board on all rocker pipe joints where the pipe is encased in concrete.

All pipework is to be installed to the manufacturer's recommendations.

Socket and gully locations and other connections to below ground drainage

All points where the below ground drainage connects to the above ground drainage or to gullies etc are to be marked out on site by the Contractor and agreed to in writing by the CA prior to commencing work.

All new drainage connections are to be terminated above finished floor level and capped off for protection, ready for connection to the above ground drainage system.

The contractor must terminate all foul drains complete with a collar above the ground level suitable for connection to the above ground soil and waste system. The supply of adaptors to the above ground drainage system will form part of this contract.

Final locations of all gullies are to be marked out on site by the Contractor prior to any drainage pipework being installed. Heights of gully bodies must take account of the revised finished ground levels that are to be incorporated throughout the below- ground drainage.

Provide flexible joints in any concrete surrounds to pipes at connections to gullies.

Manholes
Manholes shall be formed by Proprietary GRP preformed chambers (e.g. Pipex ex: ph. 01752 581200) with preformed shuttering as shown on the System Drawings.

Where the system includes works to a number of existing manholes, some of which are of considerable depth. The works include for external backdrops to a number of these manholes. Allow for surveying all manholes to be modified and ensure that the methodology is sound and will result in a safe and functioning manhole at the conclusion of the works. Develop method statements to ensure safe working throughout the works.

Manhole Covers
Manhole covers shall be as specified on the drawings. Provide 2 manhole keys for each type of keys for the client.

All internal foul drainage manholes are to include a triple sealed cover and are to be sealed with manhole grease. All internal surface water manholes are to include a double seal cover and are to be sealed with manhole grease.

CONTROL REQUIREMENTS

Fault alarms are to be taken from the pumping stations and leak detection installation to signal an alarm at the BMS. An additional run alarm is to be taken from the Cavity Drainage control panel to the BMS to signal operation.

DRAWINGS

Refer to

- R12 series as issue sheet
- All landscaping drawings
- Structural engineering drawings
- Architectural drawings relating to the ground floor slabs and structures and tank water proofing installation.

COMPONENT SPECIFICATIONS

Cast Iron Below Ground Drainage - Timersaver
Below ground buried foul and stormwater pipework.

Cast iron pipes and fittings
The systems shall be designed and installed in accordance with BS EN 12056 code of practice for gravity drainage systems inside buildings, BS EN 752-1 for drain and sewer systems outside buildings and the relevant sections of the Building Regulations.

Foul and stormwater pipework of nominal diameters, 100,150 and 225mm shall be installed using cast iron socketless pipe and fittings which fully comply with all requirements of product standard BS 437 with kitemark third party approval.

Brackets
Pipework shall be supported true to line by methods strictly in accordance with the manufacturer's recommendations. Proprietary adjustable ductile iron hanging brackets as TD 640 shall be used or brackets as recommended by the manufacturer's standard guidelines.

Jointing
Standard couplings
Pipes and fittings shall be jointed by ductile iron couplings capable of withstanding up to 5bar (accidental static water pressure) when suitably restrained with support brackets. Coupling colour shall match the pipes and fittings, and incorporate stainless steel socket cap screws and nuts wax coated.

Fittings

Junctions between pipes should use the proprietary cast iron chamber, or standard branch type fittings as recommended by the manufacturer.

Cutting pipes

Where pipes are cut on site, ends shall be cut clean and square with all burrs removed. In most cases it is not necessary to re-coat the pipe ends with 'touchup paint'. However, where there may be aggressive materials passing through the drainage system (i.e. Coca-Cola; acid rain; acids or strong alkaline or similar substances), it is necessary to protect the cut ends of the pipework to the same standard as the internal coating of the pipe (as recommended by the manufacturer).

Coating

Pipes shall be externally coated with a black alkyd primer paint. Internally coated with a two-part epoxy coating, ochre in colour, with an average thickness of 250 microns.

Fittings/couplings/brackets shall be protected internally and externally with a black water based paint.

Cast Iron Below Ground Drainage - Ensign

Below ground buried foul and stormwater pipework.

Cast iron pipes and fittings

The systems shall be designed and installed in accordance with BS EN 12056 code of practice for gravity drainage systems inside buildings, BS EN 752-1 for drain and sewer systems outside buildings and the relevant sections of the Building Regulations.

Foul and stormwater pipework of nominal diameters, 100, 150 to 600mm shall be installed using lightweight cast iron socketless pipe and fittings which fully comply with all relevant requirements of product standard BS EN 877:1999with kitemark third party approval.

Brackets

Pipework shall be supported true to line by methods strictly in accordance with the manufacturer's recommendations. Proprietary adjustable ductile iron hanging brackets as ED048 shall be used or brackets as recommended by the manufacturer's standard guidelines.

Jointing

Standard Couplings

Pipes and fittings up to 150mm diameter shall be jointed by couplings capable of withstanding up to bar (accidental static water pressure) when suitably restrained with support brackets. Pipes and fittings 200mm to 300mm diameter jointed by couplings capable of withstanding up to 3bar (accidental static water pressure) when suitably restrained with support brackets. Coupling colour shall match the pipes and fittings, and incorporate stainless steel socket cap screws and nuts wax coated.

Push-fit Couplings

Pipes and fittings 100and 150mm diameter shall be jointed by push-fit couplings incorporating 2EPDM gaskets. Meeting requirements of BS EN 877:1999.Coupling colour shall match the pipes and fittings.

High Pressure Couplings with Integral Grip

Unrestrained pipes and fittings shall be jointed by couplings capable of withstanding 5bar (accidental static water pressure) as supplied by the manufacturer (these do not require restraining brackets).

Fittings
Connection to small diameter waste and ventilating pipework or other materials shall be made using blank ends using pushfit connection or proprietary fittings.

Junctions between pipes should use the proprietary cast iron chamber, or standard branch type fittings as recommended by the manufacturer Cutting Pipes

Where pipes are cut on site, ends shall be cut clean and square with all burrs removed. In most cases it is not necessary tore-coat the pipe ends with "touch-up paint". However, where there may be aggressive materials passing through the drainage system (i.e. Coca-Cola; acid rain; acids or strong alkaline or similar substances), it is necessary to protect the cut ends of the pipework to the same standard as the internal coating of the pipe (as recommended by the manufacturer).

Coating
Pipes shall be externally coated with an initial flame applied anti-corrosive zinc coating at 130gr/m2then painted using a grey acrylic primer with an average thickness of 40microns.Internally coated with a two-part epoxy coating, ochre in colour, with an average thickness of 250microns.

Fittings/ couplings/ brackets shall be protected internally and externally with a single coat of grey powder epoxy resin electrostatically applied to an average thickness of 150microns.

Clay Below Ground Drainage Pipes

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Application
Foul and surface water drainage below and external to the building footprint.

Manufacturer and Reference
Hepworth Super Sleeve with push fit flexible couplings or approved equivalent. Kitemark certified.

Size DN as indicated on drawings

Pipes, bends and junctions
Vitrified clay to BS EN 295-1, with flexible joints.

Strength to BS EN 295-1 Tables 4 & 5.

- FN 36.
- FN 48.
- FN 54.
- FN 60.

Type of subsoil
Known : A layer of topsoil on top of Head deposits (sandy clay/clayey sand) at varying rations to a depth of approximately 0.85m. Beneath this is a Folkstone Formation sand.

Connectors
Manufacturer and reference as recommended by pipework/gully manufacturer

Flexible couplings:
Hepworth Or approved equivalent.
Standard BS EN 295-4 and Agrement certified.

Ensure that the ends of pipes are cleanly cut, square, with clean and smooth outer surfaces prior to jointing.

Apply a cement grout over the sealing area.

Bedding class
S

Warning marker tape

- Required.

Clay Below Ground Drainage Channels

Application
Within manholes

Manufacturer and Reference
Hepworth or approved equivalent. Vitrified clay to BS EN 1433. Kitemark certified

Size DN as indicated on drawings

Pumped Main Drainage Pipework – Polypropylene Plastic Pipe in Continuous Length

Application
Pumped Rising main.

Manufacturer and Reference
George Fischer PE100 or approved equivalent

Standards for performance characteristics of pipes, fittings and their joints, BS EN 15014 - reference Y10.2442.

Pipes, bends and junctions
MDPE to BS EN 13244-1, BS EN 13244-2, BS EN 13244-5.

Black. - 17.6.

Jointing

- Pupped fittings with electrofusion joints.
- Butt fusion.

Warning marker tape
Required.

Wire detection aid
Required

Filter Drains

Application
Filters drains as specified by the landscape architect. Drainage of perimeter between hard and soft surfaces as indicated on drawings.

Size DN As specified by Landscape architect

Pipes
Perforated vitrified clay to BS EN 295-5, flexibly jointed.

Lay with perforations to the top.

Pipe surround - Class X as clause 5130.

Blanket Drains

Application
To landscape architects specifications

Manufacturer and reference
Hepworth Hepline with dry push-fit flexible integral polyethylene sleeve joint or approved equivalent.

Geotextile membrane
Polypipe Type 9 Geotextile Sheeting

Joint in accordance with manufacturer's recommendations.

300mm overlap.

Lay a maximum of 15m of geotextile before covering with aggregate to prevent wind uplift. Place geotextile patches over tears with minimum lap of 300mm beyond extent of damage and cover immediately to retain in place.

Pipe drains
Perforated vitrified clay pipe to BS 295-5 1994

Pipe spacing to landscape architects specification

Pipe level
50mm below membrane level.

Pipe bed, aggregate layer
20mm nominal single size aggregate to BS EN 12620, 150mm thick.

Gullies – Plant Room Floor Gully

Application
Internal Plant Room & Kitchen Floor Gullies

Manufacturer and Reference
Wade or approved equivalent - Kitemark certified.

Size 100mm

Gulley type - Plain.

Gullies – Access Base of Downpipes

Application
Rainwater downpipe Access Gullys located at the base of all rainwater down pipes that do not run into AcoDrains

Manufacturer and Reference
Hepworth SuperSleve Access Gulley or approved equivalent. Kitemark certified.

Size 100mm

Gulley type - Plain.

Brick Inspection Chambers

Application
Surface water and Foul manholes and inspection chambers

Brickwork
BS EN 772-3 and BS EN 772-7, Class B, with frogs facing upwards.

Step irons
Galvanised ferrous to BS 1247-1.

Bed in joints to all chambers over 900 mm deep at 300 mm vertical centres staggered 300 mm horizontally. Lowest step iron no more than 300 mm above benching. Top step iron no more than 450 mm below top of cover.

Base
150 mm thick plain concrete mix

Channels, branches and benching
Conventional as outlined in this specification.

Cover slabs
Precast concrete, bed solid in 1:3 cement : sand mortar to brickwork.

Insitu concrete.

Openings to suit required access covers.

Concrete mix as clause outlined in this specification.

Reinforcement
Steel fabric to BS 4483

Access covers and seating
as scheduled

Concrete Inspection Chambers up to 6 metres Deep

Application
Surface water and Foul manholes and inspection chambers up to 6m deep

Inspection chamber
All components from same manufacturer.

- To BS 5911-3.
- To BS EN 1917.

Chamber rings, size DN – as on schedules

Straight back tapers - for inspection chambers between 2.8m and 6m deep.

Base
Insitu concrete. Thickness to BS 5911-3

Cement type
- To BS 4027.
- Class 42.5 to BS EN 197-1.

Cover slabs
Estate road type - 750mm square opening with chamfered corners or 675 x 1200mm opening with chamfered corners to suit access opening.

Joints
Cement mortar.

Steps
Steps to BS EN 13101

Galvanised ferrous.

Bed in joints to all chambers over 900mm deep at 30mm vertical centres, staggered 300mm horizontally. Lowest step iron no more than 300mm above benching. Top step iron no more than 450mm below top of cover.

Fixed ladders to BS EN 14396
Material

- Galvanised steel.
- Glass reinforced plastic.
- Aluminium alloy.

In situ concrete surround
150mm minimum thickness, mix as clause R12.320.110

Channels, branches and benching
Conventional as clause R12.350.080.

Concrete Inspection Chambers over 6 metres Deep

Application
Surface water and Foul manholes and inspection chambers over 6m deep

Inspection chamber
All components from same manufacturer.

- Class 42.5 to BS EN 197-1
- To BS EN 1917.

Chamber sections - Rectangular. Size as on schedules

Base
Insitu concrete. mix as clause R12.320.110.

Thickness as advised by Structural Engineer

Cement type

- To BS 4027.
- Class 42.5 to BS EN 197-1.

Cover slabs
Square, 75mm thick.

Joints
Cement mortar.

As recommended by inspection chamber manufacturer.

Steps
Steps to BS EN 13101

Galvanised ferrous.

Bed in joints to all chambers over 900mm deep at 30mm vertical centres, staggered 300mm horizontally. Lowest step iron no more than 300mm above benching. Top step iron no more than 450mm below top of cover.

Fixed ladders to BS EN 14396
Material

- Galvanised steel.
- Glass reinforced plastic.
- Aluminium alloy.

In situ concrete surround
150mm minimum thickness, mix as clause R12.320.110

Channels, branches and benching
Conventional as clause R12.350.080.

Conventional Channels, Branches and Benching

Bed main channel solid in 1:3 cement : sand mortar. Connect branches to channel, ideally at half channel depth, to ensure discharge flows smoothly in direction of main flow. Connect branches greater than DN 150 with level soffit to that of the main drain. For a connecting angle greater than 45 o to direction of flow use three-quarter section channel bends.

Use clips or ensure mechanical key when bedding plastic channels on to mortar.

Form benching in concrete, mix as clause R12.320.110, to rise vertically from top of main channel to a level not lower than soffit of outlet pipe, then slope upwards at 10% to walls. Within 3 hours float with coat of 1:3 cement : sand mortar and finish smooth with steel trowel.

Plastic inspection chambers

Application
Minor Shallow Manholes

Chamber manufacturer and Reference
Osma or approved equivalent.

Bedding

- As manufacturer's recommendations.
- 150mm concrete surround

Backfilling
As manufacturer's recommendations

Concrete collar
300mm wide x 225mm deep

Access covers
as Scheduled

Rodding Point

Application
Foul and Surface Water Rodding Eyes

Manufacturer and Reference
Hepworth SuperSleve Oval Rodding Point or approved equivalent.

Size
100mm and 150mm as scheduled in R12_500 series drawings

Material
Vitrified clay with aluminium oval sealing plate

Access Point

Application
Rodding access to shallow runs

Manufacturer and Reference
Hepworth SuperSleve Fittings or approved equivalent.

Size - 100 or 150mm

Assembly - Access raising piece and sealing plate and frame

Material - Vitrified Clay Kitemark certified

Rigid Backdrop Pipes Outside Inspection Chamber Wall
Encase with at least 150mm of in situ concrete as outlined in this specification.

Replace with concrete any excavated material under backdrop pipe and its surround.

Cast Iron Access Covers and Seating to BS EN 124
Type A

Application
Soakaway, foul and surface water manhole access covers

Manufacturer and reference
Selflock Wren or as specified in Dwg Nos R[12]500 series or approved equivalent.

Standard - Grey iron or ductile iron to BS EN 124.

Class reference	A15, for pedestrian use.
	B125, for light traffic use.
	C250, for slow-moving heavy traffic use.
	D400, for carriageway use.
Size	600mm x 600mm
Duty	Heavy.

Stainless steel locking bolts.

Single seal.

Seating

Make-up in engineering bricks to BS EN 772-3 and BS EN 772-7 Class B, laid in 1:3 cement : sand mortar, or precast concrete cover frame units, Type 1 or Type 2 to suit cover shape.

Bed and haunch frame solidly in 1:3 cement : sand mortar over entire area, centrally over opening, level and square with joints in surrounding finishes. Cut back top of haunching to 30mm below top of surface material.

Connection to Sewers
Connect new pipe to existing adopted sewers to conform to the requirements of the Sewerage Authority or its agent.

EXCAVATION, CONCRETE, BACKFILLING, BEDDING/JOINTING

Excavated Material
Set aside turf, topsoil, hardcore, etc., for use in reinstatement.

Lower Part of Trench
Base to 300mm above crown of pipe: trench to have vertical sides: make as small as practicable, but not less than external diameter of pipe plus 300mm.

For cover exceeding transition depth for pipe size ensure trench width up to 300mm above crown of pipe is not more than:

Nominal pipe bore (mm)	100	150	225	300
Transition depth (m)	6.0	5.4	4.0	2.9
Maximum trench width (mm)	600	700	800	900

For bedding class S, ensure trench width is not more than the following, irrespective of depth or cover.

Nominal pipe bore (mm)	100	150	225	300
Maximum trench width (mm)	600	700	800	900

Type of Subsoil
Where subsoil at the level of the crown of the pipe differs from that identified in the relevant preceding clause, obtain instructions prior to commencement.

Formation of Beds Generally
Ensure there is no delay between excavation and laying of beds or pipe.

Remove harmful materials including mud, rock projections, boulders and hard spots: replace with consolidated bedding material.

Tamp bedding material into local soft spots.

Give adequate advance notice to allow inspection of each section of the work.

Combined Trenches
For situations where one pipe is at a lower level than another adjacent pipe in a common trench.

Provided soil is stable and unlikely to break away at any step, a sub trench may be used.

Where soil is not stable the whole trench must have a depth equal to the requirements for the lower pipe: increase thickness of bedding to upper pipe as required.

Backfill lower pipe with compacted granular material to half height of upper pipe.

Trench Supports
To permit compacted filling of entire trench, remove trench supports and other obstacles as necessary to permit compacted filling of all spaces.

Trenches Less Than One Metre from Foundations
For situations where base of trench is below base of foundations, use Class Z concrete surround. Ensure top of concrete is above base of foundation.

Trenches in Excess of One Metre from Foundations
Critical level is defined as Dmm lower than level of foundation base: Dmm is equal to the horizontal distance of the near side of the trench from the foundation, less 150mm.

For situations where base of trench is lower than critical level, use Class Z concrete surround. Ensure top of concrete is above critical level.

Cross-Overs
Where two non plastic pipes cross within 300mm of each other from any point on the pipes, surround each with Class Z concrete, for at least 1m centred on the crossing point. Extend concrete surround as necessary to within 150mm of next nearest flexible joint on each pipe.

Backfilling to Pipelines Generally
Backfill from top of specified surround or protective cushion with material excavated from the trench, compacted in layers not exceeding 300mm. Until at least 600mm of cover, heavy compactors must not be used.

In Situ Concrete To BS 8500 And BS EN 206-1
Designated mix GEN 1 or Standard mix SA 2 or an equivalent or better mix subject to approval.

Foamed Concrete Backfill
Repair damaged pipes: seal off cavities in or adjacent to the excavation which are not to be filled. Obtain instructions where doubt prevails.

Undertake backfilling in accordance with British Cement Association publication 46.044, `Foamed Concrete - Specification for use in the reinstatement of openings in highways'.

Minimum density -	1050 kg/m2.
Maximum 28 day compressive strength -	10 N/mm2.
Sulphate exposure – Class –	TBC

Backfilling Under Roads and Pavings
Backfill from top of specified surround or protective cushion up to formation level with Granular Subbase Material Type 1 to DT Specification for Highway Works, Clause 803, laid and compacted in 150mm layers.

Backfilling Over Concrete
Ensure a delay of at least 24 hours between placing of concrete and backfilling. Ensure a delay of at least 72 hours between placing concrete and the use of heavy compactors or allowing traffic loads.

Temporary Bridges
To prevent construction traffic damaging pipes after backfilling, provide temporary bridges over trenches as necessary.

Class A Half Depth Concrete Support
In situ concrete as clause R12.320.110.

Lay concrete blinding, 25mm thick, and allow to set.

Lay pipes on two-layer pads of bituminous dpc or equivalent on precast concrete cradles to give a

clearance of not less than 100mm under pipes and a nominal clearance between couplings/sockets and blinding.

Lay concrete bed, width not less than external diameter of pipe plus 200mm. Shutter vertical sides of concrete or extend concrete across full width of trench.

After initial testing, place and compact more concrete for full width of concrete bed or full width of trench to halfway up each side of pipe.

Class B Half Depth Granular Support:
Granular material to BS EN 12620.

Pipe size (DN)	Nominal single size (mm)	Graded size (mm)
100 & 150	10	Not permitted
225 & 300	10 or 20	20 to 5
375 - 500	20	20 to 5
600+	20 or 40	20 or 40 to 5

Lay and compact to a thickness not less than 50mm for sleeve jointed pipes, 100mm for socket jointed pipes, over full width of trench.

Where trench bottom is uneven due to hard spots or other reason, increase depth by 100mm.

Scoop out locally at couplings/sockets and lay pipes digging slightly into bed and resting uniformly on their barrels. Adjust to line and gradient.

After initial testing, lay and compact more granular material uniformly to halfway up each side of pipe.

Backfill to 150mm (250mm for adoptable sewers) above crown of pipe with a protective cushion of selected fill, free from vegetable matter, rubbish, frozen soil and material retained on a 40mm sieve. Compact by hand in 100mm layers.

Class D Natural Bed
Excavate trench slightly shallower than the final levels.

Hand trim to accurate levels, replacing any overdig with compacted spoil. Where hand trimming is impracticable obtain instructions before proceeding.

Cut holes in trench bottom for couplings/sockets and lay pipes resting uniformly on their barrels, adjusting to line and gradient. Do not use hard packings under pipes.

After initial testing, backfill to 150mm (250mm for adoptable sewers) above crown of pipe with a protective cushion of selected fill, free from vegetable matter, rubbish, frozen soil and material retained on a 40mm sieve. Compact by hand in 100mm layers.

Class F Granular Bed
Granular material to BS EN 12620.

Pipe size (DN)	Nominal single size (mm)
100 & 150	10
225 & 300	10 or 20
375 - 500	20
600+	20 or 40

Lay and compact to a thickness not less than 50mm for sleeve jointed pipes, 100mm for socket jointed pipes, over full width of trench.

Where trench bottom is uneven due to hard spots or other reason, increase depth by 100mm.

Scoop out locally at couplings/sockets and lay pipes digging slightly into bed and resting uniformly on their barrels. Adjust to line and gradient.

After initial testing, backfill to 150mm (250mm for adoptable sewers) above crown of pipe with a protective cushion of selected fill, free from vegetable matter, rubbish, frozen soil and material retained on a 40mm sieve. Compact by hand in 100mm layers.

Class O Full Depth Granular Support
Granular material to BS EN 12620.

Pipe size (DN)	Nominal single size (mm)
100 & 150	10
225 & 300	10 or 20

Lay and compact to a thickness not less than 100mm over full width of trench. Scoop out locally at couplings/sockets and lay pipes digging slightly into bed and resting uniformly on their barrels. Adjust to line and gradient.

After initial testing, lay and compact by hand more granular material to slightly above crown of pipe.

Backfill with a protective cushion of selected fill, free from vegetable matter, rubbish, frozen soil and material retained on a 40mm sieve.

Compact by hand in 100mm layers to 300mm above crown of pipe. (100mm of granular material may be used in lieu.)

Class P Full Depth Granular Support
Granular material to BS EN 12620.

Pipe size (DN)	Nominal single size (mm)	Graded size (mm)
100 & 150	10	Not permitted
225 & 300	10 or 20	20 to 5

Lay and compact to a thickness not less than 100mm over full width of trench. Scoop out locally at couplings/sockets and lay pipes digging slightly into bed and resting uniformly on their barrels. Adjust

to line and gradient.

After initial testing, lay and compact by hand more granular material to slightly above crown of pipe.

Backfill with a protective cushion of selected fill, free from vegetable matter, rubbish, frozen soil and material retained on a 40mm sieve.

Compact by hand in 100mm layers to 300mm above crown of pipe. (100mmof granular material may be used in lieu.)

Class S Granular Surround
Granular material to BS EN 12620.

Pipe size (DN)	Nominal single size (mm)	Graded size (mm)
100 & 150	10	Not permitted
225 & 300	10 or 20	20 to 5
375 - 500	20	20 to 5
600+	20 or 40	20 or 40 to 5

Lay and compact to a thickness not less than 50mm for sleeve jointed pipes, 100mm for socket jointed pipes, over full width of trench.

Where trench bottom is uneven due to hard spots or other reason, increase depth by 100mm.

Scoop out locally at couplings/sockets and lay pipes digging slightly into bed and resting uniformly on their barrels. Adjust to line and gradient.

After initial testing, lay and compact more granular material uniformly to halfway up each side of pipe.

After initial testing, lay and compact more granular material in 100mm layers to 150mm (250mm for adoptable sewers) above crown of pipe.

Class W Granular Surround
Excavate trench after hardcore has been laid and compacted.

Granular material to BS EN 12620 .

Pipe size (DN)	Nominal single size (mm)
100 & 150	10
225 & 300	10 or 20

Lay and compact to a thickness not less than 100mm over full width of trench. Scoop out locally at couplings/sockets and lay pipes digging slightly into bed and resting uniformly on their barrels. Adjust to line and gradient.

After initial testing, lay and compact by hand more granular material to 100mm above crown of pipe.

Backfill with hardcore or granular material compacted in layers not exceeding 300mm thick up to slab formation.

Class X Granular Surround for Ground Water:
Lay 75mm deep bed, at least 100mm wider than pipe, with 10mm single size material to BS EN 12620.

Lay pipes and adjust to line and gradient.

- Complete surround with 10mm single size material compacted to 150mm above crown of pipe.
- Complete surround with 14mm single size material compacted to 150mm above crown of pipe.

Class Y Concrete Surround for Shallow Pipes Under Buildings
Where crown of pipe is less than 300mm below underside of slab, encase pipe in concrete of same mix as slab and cast integrally with the slab. Extend length of concrete surround to within 150mm of next nearest flexible joint.

Excavate trench after hardcore has been laid and compacted.

Lay concrete blinding, 25mm thick over full width of trench and allow to set.

Lay pipes on blinding on folded wedges of compressible board not less than 100mm above blinding.

Anchor the pipeline or fill with water to prevent flotation.

Class Z Concrete Surround
In situ concrete as clause R12.320.110.

Lay concrete blinding, 25mm thick over full width of trench, and allow to set.

Lay pipes on blinding on folded wedges of compressible board not less than 150mm above blinding.

Form vertical construction joints in surround at face of flexible pipe joints using 18mm thick compressible board precut to profile of pipe. Fill any gap between spigot and socket with resilient material to prevent entry of concrete.

After initial testing, place and compact more concrete for full width of trench to encase pipe

- to 150mm above crown.
- to height shown on drawings.

Warning marker tapes:
Whilst backfilling pipes lay warning marker tapes at 300 to 400mm below the level of the finished surface.

Lay in continuous line over pipe.

Install an additional marker 600mm above the top of the pipe where depth is greater than

WORKMANSHIP

Drainage Specialist

Engage a drainage specialist to develop design, to install, commission and set to work a below ground drainage system in accordance with BS EN 752 and BS EN 12056 as appropriate.

Include all civil works.

Location of Existing Drains
Prior to commencement, confirm invert levels and positions of existing drains, sewers and inspection chambers against information shown on drawings and report discrepancies.

Protect existing drains and maintain normal operation during construction.

Condition of Existing Drains
Test existing drainage to establish condition.

Undertake CCTV survey of any existing pipework that is to be re-used for the new installation, or any pipework in the vicinity of the site works that are to remain after the completion of each phase.

Obtain instructions as required to remedy defects recorded.

General
Pipes and fittings of common type to be procured from same manufacturer. Joint pipes and fittings with adaptors as recommended by particular manufacturer.

Lay pipes to line and even gradient and on even bed for full length of the pipe with any sockets facing towards direction of flow.

Use recommended lubricants for joints. Leave recommended gaps at end of spigots to allow for movement.

Protect pipelines from ingress of debris. Seal all exposed ends of pipes during construction.

Minimise time between laying and testing. Backfill after successful testing.

Installation of Fittings
Fittings must be square and tightly jointed. Align with building constructions. Request instructions where doubt prevails.

Bed and surround fittings, traps, etc. in concrete 150mm thick, insitu concrete.

Allowable deviation in level of gulley gratings +0 to -10mm.

Cover exposed ends with purpose made caps. Protect from site traffic.

Pipes Passing Through Structures
Provide short length (or rocker pipe) near external face where it is necessary to cast in or fix pipes to structures (including inspection chambers and catch pits). Install flexible joint at each end.

Pipe Size	**Distance to first joint from structure (mm)**	**Short length**
(DN) joint from structure	(mm)	(mm)
100 & 150	150	600
225 225	225	600

Where it is not necessary to cast in or fix pipes to structures (e.g. walls to footings) provide:

- short length or rocker pipes as above.
- openings in the structure: ensure 50mm minimum clearance all round pipe: closely fit a rigid sheet to each side of the opening, preventing ingress of soil or vermin.

Bends at Base of Soil Stack
Use a 90.5° nominal rest bend with a minimum radius of 200mm to centreline of the pipe.

Form with two 45° bends with a minimum radius of 200mm to centreline of the pipe.

Ensure pipe is not less than the following depth.

Up to building height of 3 storeys: distance below lowest branch 450mm.

Multi-storey buildings up to 5 storey: distance below lowest branch 750mm.

Multi-storey buildings above 5 storey: no connection on ground floor.

Stabilise bend(s) by bedding in concrete without adversely affecting the flexibility of couplings.

Direct Connection of Ground Floor WCs
Drop from crown of WC trap to invert of drain not to exceed 1.5m.

Horizontal distance from drop to ventilated drain not to exceed 6m.

INSPECTION, TESTING AND COMMISSIONING

Cleaning
Prior to final testing or CCTV inspection, remove all silt and debris by flushing entire installation with water. Repeat immediately before handover.

Refer to Health and Safety Plan with respect of safe disposal of washings and detritus. Do not discharge into sewers or watercourses.

Testing/Inspection Generally
Give advance warning to allow witnessing of tests and inspections.

The drainage installation shall be inspected by the local authority building control officer as well as the CA during construction. Allow for all necessary liaison with the building control officer for him to witness tests etc.

Provide clean water, assistance and apparatus for testing and inspection as required.

The contractor shall test the new drains in accordance with this specification and shall pressure clean all the new drains installed at the end of the construction phase, prior to PC to remove any construction debris. Carry out a CCTV survey of the complete installed below ground drainage prior to practical completion and issue a report and tape for inclusion in the building manuals.

The contractor shall test all below ground drainage pipework using air AND water test methods as described in BS8301 at various stages during the works as defined below:

Stage 1 - after pipes have been laid but prior to covering over

Stage 2 - after pipes have been covered and prior to ground slab being cast

Stage 3 - after the ground slab has been cast

Stage 4 - prior to handover

Notice of such testing of the drains shall be made in writing to the CA in compliance with the notice periods.

Ensure entire system including inspection chambers pass the tests specified. If tests fail, remedy defect(s) before retesting after an appropriate period.

Water/Air Testing of Gravity Drains and Private Sewers Up to DN 300
Immediately after completion of bedding/surround, air test short lengths of pipe to BS EN 752. For final checking and statutory authority approval, water test to BS EN 752 all pipes from terminals and connections to inspection chambers and between inspection chambers.

Testing of Adoptable and Large Private Sewers
Test sewers up and including DN 750 size to BS EN 752, as follows:

Initially, before backfilling, by air test. Finally, after backfilling, by water test. Test sewers over DN 750 size before and after backfilling in short sections or at joints to BS EN 752.

After backfilling check at inspection chambers for infiltration into sewers to BS EN 752.

Water Testing of Inspection Chambers
Before backfilling test inspection chamber to BS EN 752 for

Exfiltration - Ensure drop in water level is less than relevant dimension in Table 9.

Infiltration - Inflow to be not more than 5 litres per hour per manhole.

Water Testing of Ancillary Components
Test and commission septic tank to BS EN 12566-1 and BS EN 12566-4.

Test petrol interceptor to BS EN 752

Test surface water storage tanks to BS EN 752

Water Testing of Private Pressure Pipelines
Test pipes to BS EN 752 and following paragraphs. Test to be undertaken within 24 hours of completions of joints and installation of anchors.

Commission pumping system, and check operation of complete installation is correct under normal working conditions.

CCTV Inspection of Private Pipes
Use CCTV equipment to undertake an internal inspection of pipes: record results.

Provide all necessary equipment: provide experienced personnel to operate equipment and interpret results.

Ensure adequate illumination within pipe(s).

Record position and distance travelled continuously.

Take still photographs as instructed.

Provide copies of recordings: number of copies 2

Provide covered area for viewing monitor.

Obtain instructions as required to remedy defects recorded.

Remedy defects.

CCTV Inspection of Adoptable Pipes
Following completion allow Sewerage Authority or its agent to undertake and record an internal CCTV inspection of pipes and inspection chambers.

For pipes under highways, complete all construction except for laying of the wearing course prior to inspection.

- Obtain instructions as required to remedy defects recorded.
- Remedy defects.

HANDOVER AND DOCUMENTATION

Record Drawings
Provide record drawings of the as-built installation drains, manholes and inverts etc. and include any changes or modifications carried out on site so that the record drawings reflect the as-built installation.

The following information shall be provided:

- copies of all final test certificates for stage 3 and stage 4 testing
- manhole schedule
- layout drawings
- manufacturer's literature, specifications for products installed

Ensure that record drawings are provided for the completed below – ground drainage system. These are to be at 1:200 max scale on A1 drawings.

As Built CCTV Survey
Undertake a CCTV survey of all new & refurbished (where applicable) drainage at the completion of the project to confirm that drainage is installed straight and true. Issue a report and DVD for inclusion in the building manuals. Allow to coordinate this with the record drawings so that the sections of the survey can be identified on the record drawings. Allow to excavate to rectify any defects, including internally.

Format of Record Information
All record information to be bound together in ring binders and divided into sections (see additional preliminaries for details and no. of copies).

Provide electronic copies as described in the preliminaries.

Lifting Keys

Provide lifting keys for each type of access cover and hand over at Practical Completion.

BS APPENDIX

BS 4027:1996 Specification for sulfate-resisting portland cement

BS 4483:2005 Steel fabric for reinforcement of concrete.Specification

BS 5911-3:2010 Concrete pipes and ancillary concrete products. Part 3 Specification for unreinforced and reinforced concrete manholes and soakaways (complementary to BS EN 1917:2002).

BS 5911-4:2002+A2:2010 Concrete pipes and ancillary concrete products. Part 4 Specification for unreinforced and reinforced concrete inspection chambers (complementary to BS EN 1917:2002)

BS 65:1991 Specification for vitrified clay pipes, fittings and ducts, also flexible mechanical joints for use solely with surface water pipes and fittings

BS 7533-4:2006 Pavements constructed with clay, natural stone or concrete pavers. Part 4 Code of practice for the construction of pavements of precast concrete flags or natural stone slabs

BS 7697:1993 Nominal voltages for low voltage public electricity supply systems

BS EN 124:1994 Gully tops and manhole tops for vehicular and pedestrian areas. Design requirements, type testing, marking, quality control

BS EN 1253-5:2003 Gullies for buildings. Part 5 Gullies with light liquids closure

BS EN 12620:2002+A1:2008 Aggregates for concrete

BS EN 13101:2002 Steps for underground man entry chambers. Requirements, marking, testing and evaluation of conformity.

BS EN 1433:2002 Drainage channels for vehicular and pedestrian areas. Classification, design and testing requirements, marking and evaluation of conformity

BS EN 14396:2004 Fixed ladders for manholes

BS EN 14802:2005 Plastics piping systems. Thermoplastics shafts or risers for inspection chambers and manholes. Determination of resistance against surface and traffic loading

BS EN 15012:2007 Plastics piping systems. Soil and waste discharge systems within the building structure. Performance characteristics for pipes, fittings and their joints

BS EN 1917:2002 Concrete manholes and inspection chambers, unreinforced, steel fibre and reinforced.

BS EN 197-1:2000 Cement. Part 1 Composition, specifications and conformity criteria for common cements

BS EN 206-1:2000 Concrete. Part 1 Specification, performance, production and conformity

BS EN 295-1:1991 Vitrified clay pipes and fittings and pipe joints for drains and sewers. Part 1 Requirements

BS EN 295-4:1995 Vitrified clay pipes and fittings and pipe joints for drains and sewers. Part 4 Requirements for special fittings, adaptors and compatible accessories

BS EN 295-5:1994 Vitrified clay pipes and fittings and pipe joints for drains and sewers. Part 5 Requirements for perforated vitrified clay pipes and fittings

BS EN 752:2008 Drain and sewer systems outside buildings

BS EN 772-3:1998 Methods of test for masonry units. Part 3 Determination of net volume and percentage of voids of clay masonry units by hydrostatic weighing

BS EN 772-7:1998 Methods of test for masonry units. Part 7 Determination of water absorption of clay masonry damp proof course units by boiling in water

BS EN 877:1999+A1:2006 Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings. Requirements, test methods and quality assurance

BS EN ISO 1461:1999 Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods