File Note

ARUP

13 Fitzroy Street
London
W1T 4BQ
United Kingdom
www.arup.com

t +44 20 7636 1531
d +44 20 77552314

Project title	Haverstock Hill	Job number	268265-00
cc	George Adamopoulos Simon Jughard Laura Morris	File reference	
Prepared by	Raluca Olariu	Date	15 October 2020
Subject	Pre-planning - Condition 21		

1 Introduction

Arup has been commissioned by OD Hotels Camden Ltd. to produce the documentation needed to meet Planning Condition 21 for the 5-17 Haverstock Hill site, NW3 2BL, London.

Condition 21 – SUDS

Condition 21 was defined by London Borough of Camden (LBC) and is worded as follows:

"Prior to commencement of the development, full details of the sustainable drainage system shall be submitted to and approved in writing by the local planning authority. Such a system should be designed to accommodate all storms up to and including a 1:100 year storm with a 30% provision for climate change , such that flooding does not occur in any part of a building or in any utility plant susceptible to water, and to achieve 50% reduction in run off (targeting a maximum of 14l/s runoff in all storm events up to and including the 1 in 100 year 6 hour storm). The system shall include blue/green roofs (providing 23m^3 of storage) and an attenuation tank (providing 47m^3 of storage). And shall thereafter be retained and maintained in accordance with the approved maintenance plan."

2 Planning condition response

Please refer to Appendix A for the plan layout of the drainage design proposed for the development, and Appendix B for the modelling results of the drainage network, as modelled using MicroDrainage.

2.1 Existing Surface Water Runoff Rate

The existing hardstanding area to be drained has been determined to be 0.21ha.

The existing surface water runoff from the site are unknown. Using the Modified Rational Method, the surface water discharge was estimated for the existing site:

$$Q=2.78C_v\ C_r\ iA$$

Where:

Q=Peak discharge (/s)

C_v=Volumetric runoff coefficient

C_r=Dimensionless routing coefficient

i=Rainfall Intensity (mm/hr)

A=Catchment area (ha)

The Wallingford Procedure recommends that when used in urban catchments the following values can be used:

C_v=0.75 (range between 0.6 to 0.9)

C_r=1.3

The existing total site area is approximately 0.21ha and is assumed 100% impermeable. Therefore, the existing site runoff rate for the 100-year storm is calculated as:

A=0.21ha

i=88.14mm/hr (for 100-year return period 6 hour duration)

On this basis the pre-development runoff rate, Q, for the 1 in 100-year return period storm event of 30-minute duration is estimated to be 50.17l/s. Table 1 below presents the surface water run-off rates for the existing site for various rainfall events.

Table 1 Surface water run-off rates for different return periods

Return period	Rainfall intensity mm/hr	Existing Run-off Rate l/s
1 year	26.36	15.00
30 year	63.19	35.97
100-year	88.14	50.17

2.2 Proposed Drainage Strategy

The proposed development will have the same impermeable area as the existing site. In order to comply with the guidance outlined by LBC, it is proposed to attenuate surface water runoff in green/blue roofs and in below ground attenuation tank. The surface water runoff discharged from the site to the existing combined sewer owned by Thames Water will be through the use of a vortex flow control in the final surface water manhole.

The flow control device has been designed to limit the surface water runoff from the site to a maximum 14l/s for all rainfall events up to and including 100 year return period + 30% climate change allowance.

Condition 21 states that 23m^3 of attenuation needs to be provided in blue or green roofs and 47m^3 of attenuation will have to be provided below ground. Using MicroDrainage, the proposed surface

water drainage network was modelled based on the required attenuation volumes and the discharge flow rate stated in the Planning Condition 21.

The special requirements for attenuation have assumed, blue, green roof and the below ground attenuation as presented in Table 2:

Table 2 Attenuation breakdown for the proposed Site

Attenuation Type	Required area m2	Depth m	Storage coefficient	Volume m3
Blue Roof	220	0.1	90%	19.8
Green roof	54	0.08	84%	3.6
Below ground	75	0.66	96%	48
			Total volume of attenuation provided	**71.4**

Table 3 provides a summary of the percentage reduction in surface water runoff between the existing and proposed site. The proposed run-off rates have calculated based on the FEH data available for the site.

Table 3 Existing and Proposed Surface Runoff Reduction

Return period	Existing Run-off Rate l/s	Proposed runoff rate l/s	Runoff reduction
1 year	15.00	6	60%
30 year	35.97	10	72.2%
100-year	50.17	14	72.1%
100-year+30%CC	65.22	14	78.5%

As it can be seen in Table 3, the proposed development will reduce the existing runoff rate to more than 50%. As it is presented in Appendix B, MicroDrainage modelling results show no flooding on site for any of the events, including 100year+30% CC event. Therefore, the requirements of Condition 21 have been met.

3 Maintenance Strategy

The ongoing maintenance and management of the proposed surface water drainage system will fall under the responsibility of the site owner. Best practice information is provided in the CIRIA SUDS Manual, excerpts of which have been included below for:

- Regular Maintenance
- Occasional Maintenance
- Remedial Actions

3.1 Green Roofs

The SUDS Manual 2015 Table 12.5 (below in Figure 10) gives a recommended maintenance schedule for green roofs. Following further design development of the green/blue roof solutions on the building roofs, the maintenance requirements and a detailed plan can be prepared.

TABLE 12.5 Operation and maintenance requirements for green roofs

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Figure 1 Typical maintenance for green roofs (CIRIA SUDS Manual 2015)

3.2 Attenuation storage tank

Attenuation tanks are used to collect and store water prior discharging to the combined sewer on Adelaide Road. The SUDS Manual 2015 Table 21.3 (below in Figure 11) gives a recommended maintenance schedule for attenuation tanks:

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Figure 2 Typical maintenance of attenuation tanks (CIRIA SUDS Manual 2015)

3.3 Flow control device

The flow control device is located at the end of the system to restrict surface water flows discharging from the site. The maintenance schedule was compiled from the Hydro-International website. Typical maintenance is presented in Table 7.

Table 4 Typical maintenance of vortex flow control

Maintenance schedule	**Required action**	**Frequency**
Regular Maintenance	Debris removal (leaves, rubbish, tree branches) from the drainage network	Monthly
Remedial Actions	When flooding occurs dur to blockages in the drainage network, drain down manhole(s) and jet pipes to remove blockages.	As required
Monitoring	Inspect unit and hose down if required	Monthly for the first three months; Every six months after

3.4 Gullies

Inspection and removal of debris from silt trap once a year, preferable after the leaf fall in autumn.

3.5 Drainage pipes, manholes & silt traps

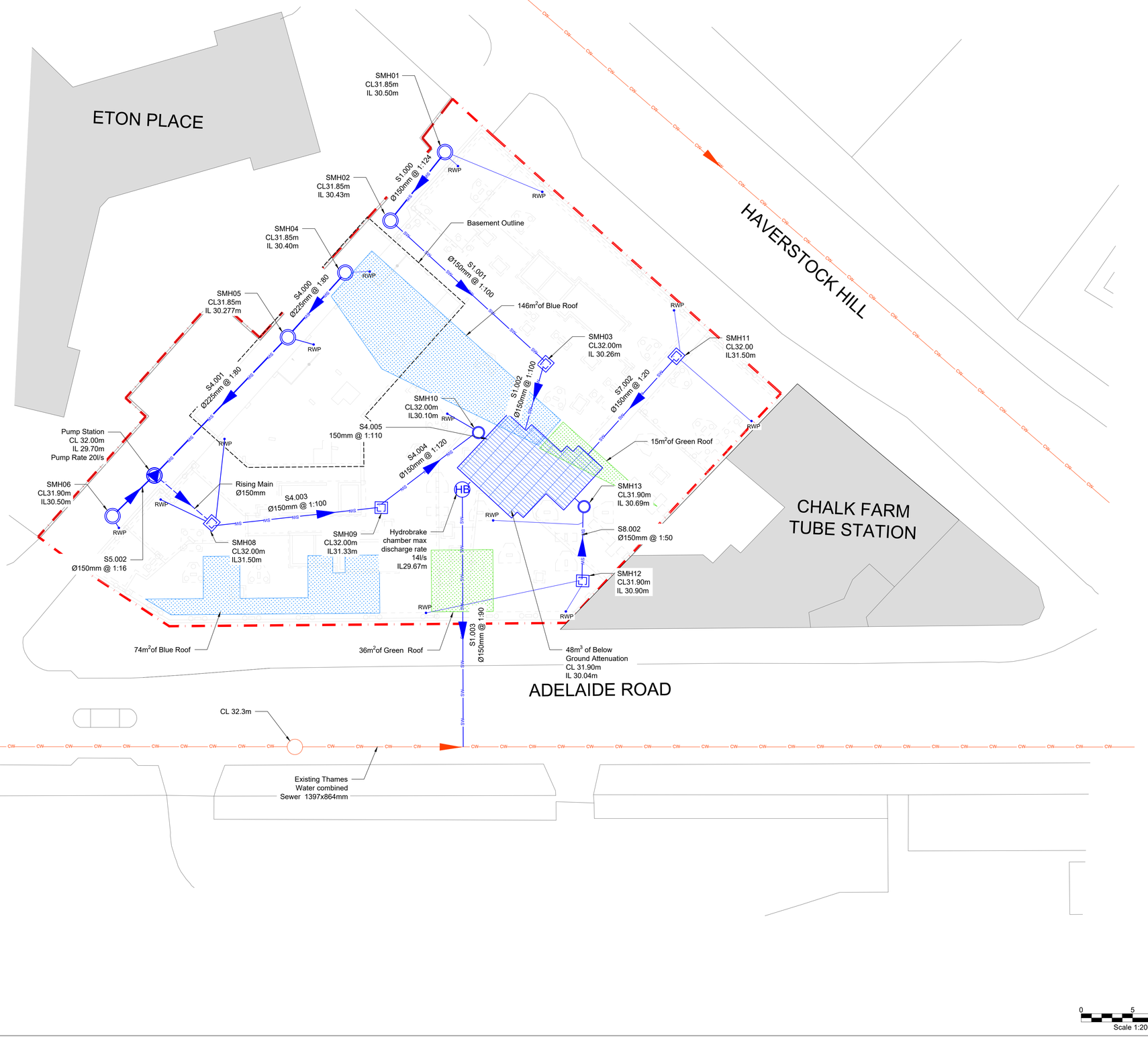
Inspect manholes & silt traps for build-up of silt and general debris (once a year, preferably after leaf fall in the autumn). If silt/debris is building up, a regular clean with jetting lorry / gully sucker is required. Pipe inspection after jetting should be undertaken and repeat cleaning if required. If the pipes to be jetted are plastic then a high flow, low pressure setting should be used so that the pipes are not damaged.

NOTE: Manhole covers can be heavy and suitable lifting equipment / procedures should be used. Untrained personnel should not enter manholes to carry out maintenance.

Appendix A – Drainage Strategy Layout

Design Notes	
Greenfield runoff rates:	
Site Area	2,070m²
Total Existing Impermeable Area	2,070m²
Existing Peak rate run off from Impermeable Areas (50mm/hr)	28.8l/s
Proposed restricted Surface Water discharge rate	14.0l/s
Total Attenuation for 100YS + 30%CC:	70 m³

Attenuation Notes	
Green Roof	Roof Area = 54m² Max. Water Depth = 0.08m Total=3m³
Blue Roof	Roof Area = 220m² Max. Water Depth = 0.1m Total=20m³
Attenuation Tank	75m x 0.66m deep Total = 48m³
Total Attenuation	70m³



0 5 10 Metres
Scale 1:200

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NOTES

1. Do not scale from this drawing.
2. Position and invert levels of existing Thames Water chambers and sewers to be confirmed on site prior to the commencement of any works.
3. The position of the blue/green roof outfalls are indicative. Architect and/or MEP engineer to confirm the exact locations as appropriate.
4. Proposed drainage to be coordinated with existing underground services.
5. Cover levels are indicative and shall be adjusted locally to suit finished ground level.
6. Where new sewers are constructed within 5m of a new or existing tree the sewer shall be concrete encased against root intrusion.
7. CCTV survey to be undertaken on the private combined sewer and Thames Water sewer on site to determine any additional connections required to be accounted for.
8. The proposed building layout is based on drawing "2140870-X-00-DR-S-1100_P3" by Conisbee dated 07.05.19

LEGEND

Site Boundary

Proposed Utilities

Stormwater Sewer & Manhole (SW)

Stormwater Rising Main

Stormwater Attenuation Tank

Flow Control/Hydrobrake Chamber (HB)

Blue Roof Attenuation

Biodiversity Roof

Blue Roof Outlet/Rainwater Pipe (RWP)

Existing Utilities

Combined Sewer & Manhole (Thames Water Asset) (CW)

Foul Water Sewer & Manhole (Private Asset) (CW)

Issue	Date	By	Chkd	Appd
P01	23/10/20	TB	RO	TMcD
For Information				

ARUP

13 Fitzroy Street
London W1T 4BQ
Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924
www.arup.com

Client
Best Star Real Estate 2

Job Title
Haverstock Hill

Key Plan

Drawing Title
Condition 21 Drainage Layout

Scale at A1 1:200

Discipline Civil

Job No 268265-00

Drawing Status For Information

Drawing No HH-ARP-DR-C-0003 P01

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Do not scale

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Appendix B - MicroDrainage Results

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.700	Add Flow / Climate Change (%)	0
Ratio R	0.439	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	8.697	0.070	124.2	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	2.180	0.000	0.0	0.008	5.00	0.0	0.600	o	100	Pipe/Conduit	
S2.001	3.309	9.370	0.4	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.001	16.922	0.169	100.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	3.281	0.000	0.0	0.008	5.00	0.0	0.600	o	100	Pipe/Conduit	
S3.001	3.806	9.539	0.4	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.002	15.056	0.147	102.4	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	177.48	5.16	30.500	0.028	0.0	0.0	0.0	0.90	15.9	13.5
S2.000	172.94	5.52	39.850	0.008	0.0	0.0	0.0	0.07	0.5«	3.7
S2.001	172.89	5.53	39.850	0.008	0.0	0.0	0.0	13.14	103.2	3.7
S1.001	169.57	5.81	30.430	0.036	0.0	0.0	0.0	1.00	17.7	16.5
S3.000	169.81	5.79	39.850	0.008	0.0	0.0	0.0	0.07	0.5«	3.7
S3.001	169.76	5.79	39.850	0.008	0.0	0.0	0.0	12.36	97.1	3.7
S1.002	166.72	6.06	30.261	0.055	0.0	0.0	0.0	0.99	17.5«	24.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	9.835	0.123	80.0	0.015	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	18.645	0.233	80.0	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	1.183	0.000	0.0	0.004	5.00	0.0	0.600	o	100	Pipe/Conduit	
S5.001	1.183	8.950	0.1	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S5.002	6.040	0.381	15.9	0.023	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.002	6.163	-1.356	-4.5	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.003	17.162	0.172	99.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.000	2.000	0.000	0.0	0.004	5.00	0.0	0.600	o	100	Pipe/Conduit	
S6.001	1.764	8.127	0.2	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S4.004	13.362	0.111	120.4	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.005	9.406	0.085	110.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.000	3.742	0.000	0.0	0.002	5.00	0.0	0.600	o	100	Pipe/Conduit	
S7.001	8.118	7.950	1.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S7.002	16.027	0.807	19.9	0.031	0.00	0.0	0.600	o	150	Pipe/Conduit	
S8.000	7.280	0.000	0.0	0.004	5.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	178.11	5.11	30.400	0.015	0.0	0.0	0.0	1.46	58.2	7.1
S4.001	175.39	5.32	30.277	0.043	0.0	0.0	0.0	1.46	58.2	20.5
S5.000	175.91	5.28	39.500	0.004	0.0	0.0	0.0	0.07	0.5«	1.9
S5.001	175.90	5.28	39.500	0.004	0.0	0.0	0.0	21.49	168.7	1.9
S5.002	175.40	5.32	30.500	0.027	0.0	0.0	0.0	2.54	44.9	12.6
S4.002	162.73	6.43	30.119	0.085	0.0	0.0	0.0	0.09	1.6«	37.5
S4.003	159.83	6.72	31.500	0.085	0.0	0.0	0.0	1.01	17.8«	37.5
S6.000	173.47	5.48	39.500	0.004	0.0	0.0	0.0	0.07	0.5«	1.9
S6.001	173.45	5.48	39.500	0.004	0.0	0.0	0.0	16.76	131.7	1.9
S4.004	157.45	6.96	31.328	0.092	0.0	0.0	0.0	0.91	16.2«	39.3
S4.005	155.89	7.12	30.099	0.092	0.0	0.0	0.0	0.95	16.9«	39.3
S7.000	168.55	5.90	39.500	0.002	0.0	0.0	0.0	0.07	0.5«	0.9
S7.001	168.35	5.92	39.500	0.002	0.0	0.0	0.0	7.72	60.6	0.9
S7.002	167.03	6.03	31.500	0.033	0.0	0.0	0.0	2.27	40.1	15.1
S8.000	159.54	6.75	39.500	0.004	0.0	0.0	0.0	0.07	0.5«	1.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.001	4.176	8.550	0.5	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S8.002	10.359	0.207	50.0	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.003	9.259	0.579	16.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	8.140	0.099	82.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	2.569	0.026	98.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	15.238	0.190	80.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S8.001	159.48	6.75	39.500	0.004	0.0	0.0	0.0	11.17	87.7	1.7
S8.002	158.29	6.87	30.900	0.021	0.0	0.0	0.0	1.43	25.2	9.1
S7.003	157.70	6.93	30.693	0.055	0.0	0.0	0.0	2.53	44.7	23.4
S1.003	155.02	7.22	30.039	0.201	0.0	0.0	0.0	1.44	57.4«	84.6
S1.004	154.72	7.25	29.940	0.201	0.0	0.0	0.0	1.32	52.3«	84.6
S1.005	153.15	7.42	29.914	0.201	0.0	0.0	0.0	1.46	58.1«	84.6

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	8	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SMH01	15 Winter	1	+0%	100/15 Summer		
S2.000	SRoofBlueN.1	360 Winter	1	+0%			
S2.001	SOrificeN.1	360 Winter	1	+0%			
S1.001	SMH002	15 Winter	1	+0%	100/15 Summer		
S3.000	SRoofBlueN.2	360 Winter	1	+0%			
S3.001	SOrificeN.2	360 Winter	1	+0%			
S1.002	SMH03	15 Winter	1	+0%	30/30 Winter		
S4.000	SMH04	15 Winter	1	+0%	100/15 Summer		
S4.001	SMH05	15 Winter	1	+0%	30/15 Summer		
S5.000	SRoodBlueS.1	180 Winter	1	+0%			
S5.001	SOrificeS.1	180 Winter	1	+0%			
S5.002	SMH06	15 Winter	1	+0%	100/15 Summer		
S4.002	SPump station	15 Winter	1	+0%	10/15 Summer		
S4.003	SMH08	15 Winter	1	+0%	10/15 Summer		
S6.000	SRoofBlueS.2	240 Winter	1	+0%			
S6.001	SOrificeS.2	240 Winter	1	+0%			
S4.004	SMH09	15 Winter	1	+0%	10/15 Summer		
S4.005	SMH10	15 Winter	1	+0%	10/15 Summer		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SMH01		30.556	-0.094	0.000	0.29			4.1
S2.000	SRoofBlueN.1		39.863	-0.087	0.000	0.01		337	0.1
S2.001	SOrificeN.1		39.863	-0.087	0.000	0.00			0.1
S1.001	SMH002		30.481	-0.099	0.000	0.25			4.1
S3.000	SRoofBlueN.2		39.864	-0.086	0.000	0.02		330	0.1
S3.001	SOrificeN.2		39.863	-0.087	0.000	0.00			0.1
S1.002	SMH03		30.321	-0.090	0.000	0.34			5.5
S4.000	SMH04		30.431	-0.194	0.000	0.04			2.2
S4.001	SMH05		30.327	-0.175	0.000	0.11			5.7
S5.000	SRoodBlueS.1		39.512	-0.088	0.000	0.01		173	0.0
S5.001	SOrificeS.1		39.511	-0.089	0.000	0.00			0.0
S5.002	SMH06		30.527	-0.123	0.000	0.08			2.8
S4.002	SPump station		30.172	-0.097	0.000	1.27			10.5
S4.003	SMH08		31.587	-0.063	0.000	0.63			10.5
S6.000	SRoofBlueS.2		39.512	-0.088	0.000	0.01		191	0.0
S6.001	SOrificeS.2		39.511	-0.089	0.000	0.00			0.0
S4.004	SMH09		31.424	-0.054	0.000	0.73			10.8
S4.005	SMH10		30.195	-0.054	0.000	0.73			10.8

PN	US/MH Name	Status	Level Exceeded
S1.000	SMH01	OK	
S2.000	SRoofBlueN.1	FLOOD RISK	
S2.001	SOrificeN.1	FLOOD RISK	
S1.001	SMH002	OK	
S3.000	SRoofBlueN.2	FLOOD RISK	
S3.001	SOrificeN.2	FLOOD RISK	
S1.002	SMH03	OK	
S4.000	SMH04	OK	
S4.001	SMH05	OK	
S5.000	SRoodBlueS.1	OK	
S5.001	SOrificeS.1	OK	
S5.002	SMH06	OK	
S4.002	SPump station	OK	
S4.003	SMH08	OK	
S6.000	SRoofBlueS.2	OK	
S6.001	SOrificeS.2	OK	
S4.004	SMH09	OK	
S4.005	SMH10	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S7.000	SRoofGreenN	120 Winter	1	+0%				
S7.001	SOrificeGN	120 Winter	1	+0%				
S7.002	SMH11	15 Winter	1	+0%				
S8.000	SRoofGreen.2	120 Winter	1	+0%				
S8.001	SOrifice G2	120 Winter	1	+0%				
S8.002	SMH12	15 Winter	1	+0%				
S7.003	SMH13	15 Winter	1	+0%	100/60 Winter			
S1.003	SMH14	60 Winter	1	+0%	10/15 Winter			
S1.004	SMH15	60 Winter	1	+0%				
S1.005	SMH16	60 Winter	1	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S7.000	SRoofGreenN	39.510	-0.090	0.000	0.01		111	0.0	OK
S7.001	SOrificeGN	39.509	-0.091	0.000	0.00			0.0	OK
S7.002	SMH11	31.533	-0.117	0.000	0.11			3.9	OK
S8.000	SRoofGreen.2	39.518	-0.082	0.000	0.03		93	0.1	OK
S8.001	SOrifice G2	39.515	-0.085	0.000	0.00			0.1	OK
S8.002	SMH12	30.931	-0.119	0.000	0.10			2.2	OK
S7.003	SMH13	30.732	-0.110	0.000	0.15			6.1	OK
S1.003	SMH14	30.175	-0.089	0.000	0.13		33	5.9	OK
S1.004	SMH15	30.007	-0.158	0.000	0.20			5.9	OK
S1.005	SMH16	29.964	-0.175	0.000	0.11			5.9	OK

PN	US/MH Name	Level Exceeded
S7.000	SRoofGreenN	
S7.001	SOrificeGN	
S7.002	SMH11	
S8.000	SRoofGreen.2	
S8.001	SOrifice G2	
S8.002	SMH12	
S7.003	SMH13	
S1.003	SMH14	
S1.004	SMH15	
S1.005	SMH16	

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10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	8	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SMH01	15 Winter	10	+0%	100/15 Summer		
S2.000	SRoofBlueN.1	180 Winter	10	+0%			
S2.001	SOrificeN.1	180 Winter	10	+0%			
S1.001	SMH002	15 Winter	10	+0%	100/15 Summer		
S3.000	SRoofBlueN.2	180 Winter	10	+0%			
S3.001	SOrificeN.2	180 Winter	10	+0%			
S1.002	SMH03	15 Winter	10	+0%	30/30 Winter		
S4.000	SMH04	15 Winter	10	+0%	100/15 Summer		
S4.001	SMH05	15 Winter	10	+0%	30/15 Summer		
S5.000	SRoodBlueS.1	120 Winter	10	+0%			
S5.001	SOrificeS.1	120 Winter	10	+0%			
S5.002	SMH06	15 Winter	10	+0%	100/15 Summer		
S4.002	SPump station	15 Winter	10	+0%	10/15 Summer		
S4.003	SMH08	15 Winter	10	+0%	10/15 Summer		
S6.000	SRoofBlueS.2	120 Winter	10	+0%			
S6.001	SOrificeS.2	120 Winter	10	+0%			
S4.004	SMH09	15 Winter	10	+0%	10/15 Summer		
S4.005	SMH10	15 Winter	10	+0%	10/15 Summer		

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10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SMH01		30.582	-0.068	0.000	0.57			8.0
S2.000	SRoofBlueN.1		39.871	-0.079	0.000	0.04		210	0.1
S2.001	SOrificeN.1		39.870	-0.080	0.000	0.00			0.1
S1.001	SMH002		30.504	-0.076	0.000	0.48			8.0
S3.000	SRoofBlueN.2		39.872	-0.078	0.000	0.04		203	0.2
S3.001	SOrificeN.2		39.871	-0.079	0.000	0.00			0.2
S1.002	SMH03		30.353	-0.058	0.000	0.68			11.0
S4.000	SMH04		30.445	-0.180	0.000	0.09			4.2
S4.001	SMH05		30.375	-0.127	0.000	0.24			12.7
S5.000	SRoodBlueS.1		39.518	-0.082	0.000	0.03		119	0.1
S5.001	SOrificeS.1		39.518	-0.082	0.000	0.00			0.1
S5.002	SMH06		30.543	-0.107	0.000	0.18			6.9
S4.002	SPump station		30.354	0.085	0.000	2.41			20.0
S4.003	SMH08		31.821	0.171	0.000	1.20			19.9
S6.000	SRoofBlueS.2		39.519	-0.081	0.000	0.03		122	0.1
S6.001	SOrificeS.2		39.518	-0.082	0.000	0.00			0.1
S4.004	SMH09		31.571	0.093	0.000	1.38			20.4
S4.005	SMH10		30.408	0.159	0.000	1.34			20.0

PN	US/MH Name	Status	Level Exceeded
S1.000	SMH01	OK	
S2.000	SRoofBlueN.1	FLOOD RISK	
S2.001	SOrificeN.1	FLOOD RISK	
S1.001	SMH002	OK	
S3.000	SRoofBlueN.2	FLOOD RISK	
S3.001	SOrificeN.2	FLOOD RISK	
S1.002	SMH03	OK	
S4.000	SMH04	OK	
S4.001	SMH05	OK	
S5.000	SRoodBlueS.1	OK	
S5.001	SOrificeS.1	OK	
S5.002	SMH06	OK	
S4.002	SPump station	SURCHARGED	
S4.003	SMH08	FLOOD RISK	
S6.000	SRoofBlueS.2	OK	
S6.001	SOrificeS.2	OK	
S4.004	SMH09	SURCHARGED	
S4.005	SMH10	SURCHARGED	

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10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S7.000	SRoofGreenN	60 Winter	10	+0%				
S7.001	SOrificeGN	60 Winter	10	+0%				
S7.002	SMH11	15 Winter	10	+0%				
S8.000	SRoofGreen.2	60 Winter	10	+0%				
S8.001	SOrifice G2	60 Winter	10	+0%				
S8.002	SMH12	15 Winter	10	+0%				
S7.003	SMH13	15 Summer	10	+0%	100/60 Winter			
S1.003	SMH14	60 Winter	10	+0%	10/15 Winter			
S1.004	SMH15	60 Winter	10	+0%				
S1.005	SMH16	60 Winter	10	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S7.000	SRoofGreenN	39.516	-0.084	0.000	0.02		75	0.1
S7.001	SOrificeGN	39.515	-0.085	0.000	0.00			0.1
S7.002	SMH11	31.552	-0.098	0.000	0.26			9.6
S8.000	SRoofGreen.2	39.529	-0.071	0.000	0.08		53	0.2
S8.001	SOrifice G2	39.525	-0.075	0.000	0.00			0.2
S8.002	SMH12	30.949	-0.101	0.000	0.24			5.3
S7.003	SMH13	30.757	-0.086	0.000	0.38			14.9
S1.003	SMH14	30.317	0.053	0.000	0.19		38	8.3
S1.004	SMH15	30.020	-0.145	0.000	0.28			8.3
S1.005	SMH16	29.974	-0.165	0.000	0.16			8.3

PN	US/MH Name	Status	Level Exceeded
S7.000	SRoofGreenN	OK	
S7.001	SOrificeGN	OK	
S7.002	SMH11	OK	
S8.000	SRoofGreen.2	OK	
S8.001	SOrifice G2	OK	
S8.002	SMH12	OK	
S7.003	SMH13	OK	
S1.003	SMH14	SURCHARGED	
S1.004	SMH15	OK	
S1.005	SMH16	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	8	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SMH01	15 Winter	30	+0%	100/15 Summer		
S2.000	SRoofBlueN.1	180 Winter	30	+0%			
S2.001	SOrificeN.1	180 Winter	30	+0%			
S1.001	SMH002	15 Winter	30	+0%	100/15 Summer		
S3.000	SRoofBlueN.2	120 Winter	30	+0%			
S3.001	SOrificeN.2	120 Winter	30	+0%			
S1.002	SMH03	60 Winter	30	+0%	30/30 Winter		
S4.000	SMH04	15 Winter	30	+0%	100/15 Summer		
S4.001	SMH05	15 Winter	30	+0%	30/15 Summer		
S5.000	SRoodBlueS.1	120 Winter	30	+0%			
S5.001	SOrificeS.1	120 Winter	30	+0%			
S5.002	SMH06	15 Winter	30	+0%	100/15 Summer		
S4.002	SPump station	15 Winter	30	+0%	10/15 Summer		
S4.003	SMH08	15 Winter	30	+0%	10/15 Summer		
S6.000	SRoofBlueS.2	120 Winter	30	+0%			
S6.001	SOrificeS.2	120 Winter	30	+0%			
S4.004	SMH09	15 Winter	30	+0%	10/15 Summer		
S4.005	SMH10	30 Winter	30	+0%	10/15 Summer		

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SMH01		30.596	-0.054	0.000	0.72			10.1
S2.000	SRoofBlueN.1		39.876	-0.074	0.000	0.06		177	0.2
S2.001	SOrificeN.1		39.875	-0.075	0.000	0.00			0.2
S1.001	SMH002		30.516	-0.064	0.000	0.61			10.1
S3.000	SRoofBlueN.2		39.877	-0.073	0.000	0.06			0.2
S3.001	SOrificeN.2		39.875	-0.075	0.000	0.00			0.2
S1.002	SMH03		30.422	0.011	0.000	0.44			7.1
S4.000	SMH04		30.613	-0.012	0.000	0.10			4.9
S4.001	SMH05		30.607	0.105	0.000	0.25			13.0
S5.000	SRoodBlueS.1		39.522	-0.078	0.000	0.04		102	0.2
S5.001	SOrificeS.1		39.522	-0.078	0.000	0.00			0.2
S5.002	SMH06		30.598	-0.052	0.000	0.23			8.8
S4.002	SPump station		30.586	0.317	0.000	2.41			20.0
S4.003	SMH08		31.827	0.177	0.000	1.21			20.0
S6.000	SRoofBlueS.2		39.523	-0.077	0.000	0.04		105	0.2
S6.001	SOrificeS.2		39.522	-0.078	0.000	0.00			0.2
S4.004	SMH09		31.577	0.099	0.000	1.40			20.7
S4.005	SMH10		30.510	0.261	0.000	1.35			20.2

PN	US/MH Name	Status	Level Exceeded
S1.000	SMH01	OK	
S2.000	SRoofBlueN.1	FLOOD RISK	
S2.001	SOrificeN.1	FLOOD RISK	
S1.001	SMH002	OK	
S3.000	SRoofBlueN.2	FLOOD RISK	
S3.001	SOrificeN.2	FLOOD RISK	
S1.002	SMH03	SURCHARGED	
S4.000	SMH04	OK	
S4.001	SMH05	SURCHARGED	
S5.000	SRoodBlueS.1	OK	
S5.001	SOrificeS.1	OK	
S5.002	SMH06	OK	
S4.002	SPump station	SURCHARGED	
S4.003	SMH08	FLOOD RISK	
S6.000	SRoofBlueS.2	OK	
S6.001	SOrificeS.2	OK	
S4.004	SMH09	SURCHARGED	
S4.005	SMH10	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S7.000	SRoofGreenN	60 Winter	30	+0%				
S7.001	SOrificeGN	60 Winter	30	+0%				
S7.002	SMH11	15 Winter	30	+0%				
S8.000	SRoofGreen.2	60 Winter	30	+0%				
S8.001	SOrifice G2	60 Winter	30	+0%				
S8.002	SMH12	15 Winter	30	+0%				
S7.003	SMH13	15 Summer	30	+0%	100/60 Winter			
S1.003	SMH14	60 Winter	30	+0%	10/15 Winter			
S1.004	SMH15	60 Winter	30	+0%				
S1.005	SMH16	60 Winter	30	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S7.000	SRoofGreenN	39.520	-0.080	0.000	0.03		64	0.1
S7.001	SOrificeGN	39.518	-0.082	0.000	0.00			0.1
S7.002	SMH11	31.559	-0.091	0.000	0.33			12.3
S8.000	SRoofGreen.2	39.535	-0.065	0.000	0.12		47	0.3
S8.001	SOrifice G2	39.531	-0.069	0.000	0.00			0.3
S8.002	SMH12	30.956	-0.094	0.000	0.30			6.7
S7.003	SMH13	30.766	-0.076	0.000	0.48			19.0
S1.003	SMH14	30.412	0.148	0.000	0.22		43	9.6
S1.004	SMH15	30.027	-0.138	0.000	0.32			9.6
S1.005	SMH16	29.980	-0.159	0.000	0.19			9.6

PN	US/MH Name	Status	Level Exceeded
S7.000	SRoofGreenN	OK	
S7.001	SOrificeGN	OK	
S7.002	SMH11	OK	
S8.000	SRoofGreen.2	OK	
S8.001	SOrifice G2	OK	
S8.002	SMH12	OK	
S7.003	SMH13	OK	
S1.003	SMH14	SURCHARGED	
S1.004	SMH15	OK	
S1.005	SMH16	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	8	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.600	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SMH01	60 Winter	100	+30%	100/15 Summer		
S2.000	SRoofBlueN.1	120 Winter	100	+30%			
S2.001	SOrificeN.1	120 Winter	100	+30%			
S1.001	SMH002	60 Winter	100	+30%	100/15 Summer		
S3.000	SRoofBlueN.2	120 Winter	100	+30%			
S3.001	SOrificeN.2	120 Winter	100	+30%			
S1.002	SMH03	60 Winter	100	+30%	30/30 Winter		
S4.000	SMH04	15 Winter	100	+30%	100/15 Summer		
S4.001	SMH05	15 Winter	100	+30%	30/15 Summer		
S5.000	SRoodBlueS.1	60 Winter	100	+30%			
S5.001	SOrificeS.1	60 Winter	100	+30%			
S5.002	SMH06	15 Winter	100	+30%	100/15 Summer		
S4.002	SPump station	15 Winter	100	+30%	10/15 Summer		
S4.003	SMH08	15 Winter	100	+30%	10/15 Summer		
S6.000	SRoofBlueS.2	60 Winter	100	+30%			
S6.001	SOrificeS.2	60 Winter	100	+30%			
S4.004	SMH09	15 Winter	100	+30%	10/15 Summer		
S4.005	SMH10	60 Winter	100	+30%	10/15 Summer		

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SMH01		30.986	0.336	0.000	0.62			8.7
S2.000	SRoofBlueN.1		39.890	-0.060	0.000	0.13		115	0.5
S2.001	SOrificeN.1		39.888	-0.062	0.000	0.01			0.5
S1.001	SMH002		30.980	0.400	0.000	0.52			8.6
S3.000	SRoofBlueN.2		39.891	-0.059	0.000	0.14		110	0.5
S3.001	SOrificeN.2		39.889	-0.061	0.000	0.01			0.5
S1.002	SMH03		30.970	0.559	0.000	0.67			10.8
S4.000	SMH04		31.749	1.124	0.000	0.10			4.8
S4.001	SMH05		31.743	1.241	0.000	0.28			14.7
S5.000	SRoodBlueS.1		39.534	-0.066	0.000	0.11		64	0.4
S5.001	SOrificeS.1		39.534	-0.066	0.000	0.01			0.4
S5.002	SMH06		31.734	1.084	0.000	0.29			10.9
S4.002	SPump station		31.721	1.452	0.000	2.41			20.0
S4.003	SMH08		31.848	0.198	0.000	1.21			20.1
S6.000	SRoofBlueS.2		39.534	-0.066	0.000	0.10		66	0.4
S6.001	SOrificeS.2		39.533	-0.067	0.000	0.01			0.4
S4.004	SMH09		31.599	0.121	0.000	1.46			21.6
S4.005	SMH10		30.996	0.747	0.000	1.38			20.6

PN	US/MH Name	Status	Level Exceeded
S1.000	SMH01	SURCHARGED	
S2.000	SRoofBlueN.1	FLOOD RISK	
S2.001	SOrificeN.1	FLOOD RISK	
S1.001	SMH002	SURCHARGED	
S3.000	SRoofBlueN.2	FLOOD RISK	
S3.001	SOrificeN.2	FLOOD RISK	
S1.002	SMH03	SURCHARGED	
S4.000	SMH04	FLOOD RISK	
S4.001	SMH05	FLOOD RISK	
S5.000	SRoodBlueS.1	OK	
S5.001	SOrificeS.1	OK	
S5.002	SMH06	FLOOD RISK	
S4.002	SPump station	FLOOD RISK	
S4.003	SMH08	FLOOD RISK	
S6.000	SRoofBlueS.2	OK	
S6.001	SOrificeS.2	OK	
S4.004	SMH09	SURCHARGED	
S4.005	SMH10	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S7.000	SRoofGreenN	60 Winter	100	+30%				
S7.001	SOrificeGN	60 Winter	100	+30%				
S7.002	SMH11	15 Winter	100	+30%				
S8.000	SRoofGreen.2	30 Winter	100	+30%				
S8.001	SOrifice G2	30 Winter	100	+30%				
S8.002	SMH12	15 Winter	100	+30%				
S7.003	SMH13	60 Winter	100	+30%	100/60 Winter			
S1.003	SMH14	60 Winter	100	+30%	10/15 Winter			
S1.004	SMH15	30 Winter	100	+30%				
S1.005	SMH16	60 Summer	100	+30%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S7.000	SRoofGreenN	39.530	-0.070	0.000	0.07		46	0.3
S7.001	SOrificeGN	39.528	-0.072	0.000	0.00			0.3
S7.002	SMH11	31.580	-0.070	0.000	0.56			20.7
S8.000	SRoofGreen.2	39.552	-0.048	0.000	0.25		28	0.7
S8.001	SOrifice G2	39.547	-0.053	0.000	0.01			0.7
S8.002	SMH12	30.976	-0.074	0.000	0.51			11.4
S7.003	SMH13	30.969	0.126	0.000	0.40			15.8
S1.003	SMH14	30.955	0.691	0.000	0.32		57	14.0
S1.004	SMH15	30.048	-0.117	0.000	0.47			14.0
S1.005	SMH16	29.994	-0.145	0.000	0.27			14.0

PN	US/MH Name	Status	Level Exceeded
S7.000	SRoofGreenN	OK	
S7.001	SOrificeGN	OK	
S7.002	SMH11	OK	
S8.000	SRoofGreen.2	OK	
S8.001	SOrifice G2	OK	
S8.002	SMH12	OK	
S7.003	SMH13	SURCHARGED	
S1.003	SMH14	SURCHARGED	
S1.004	SMH15	OK	
S1.005	SMH16	OK	

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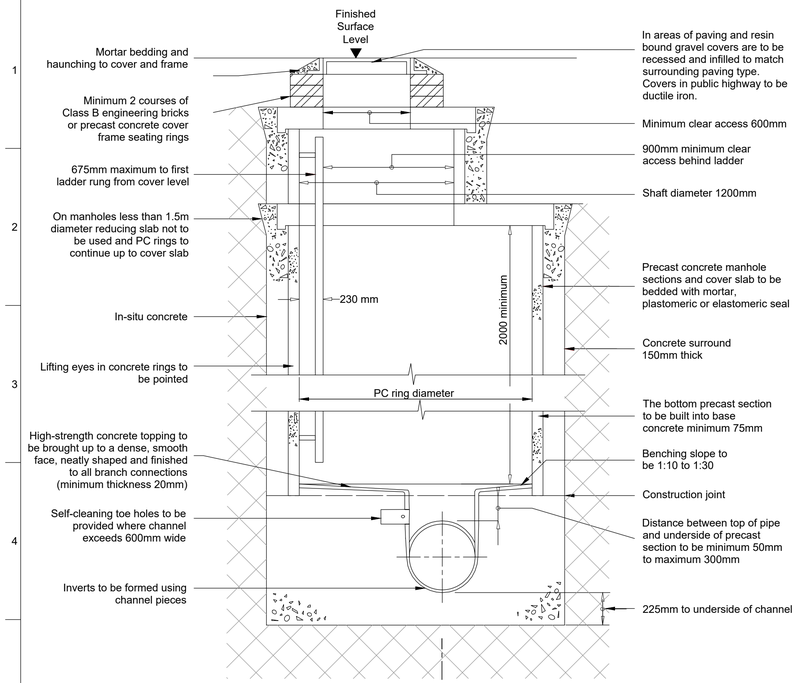
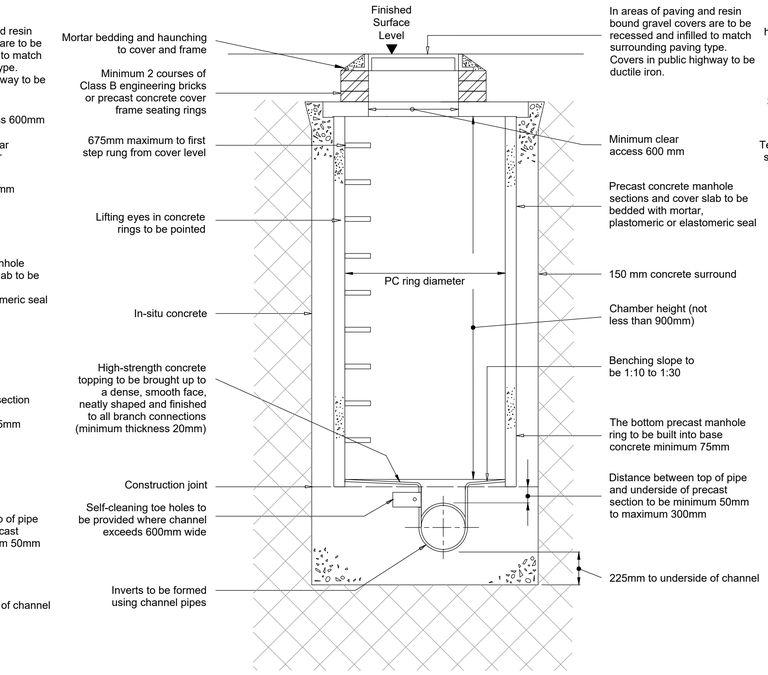
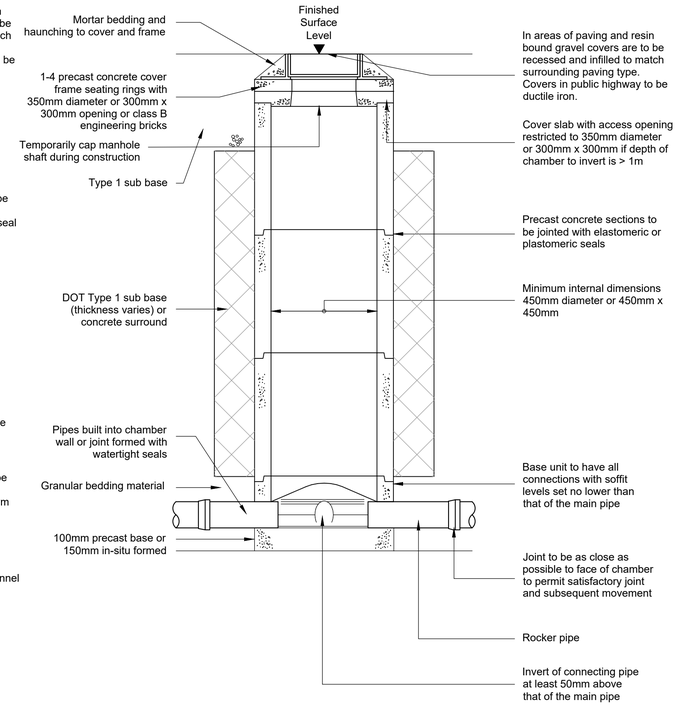
Appendix C - Drainage Details

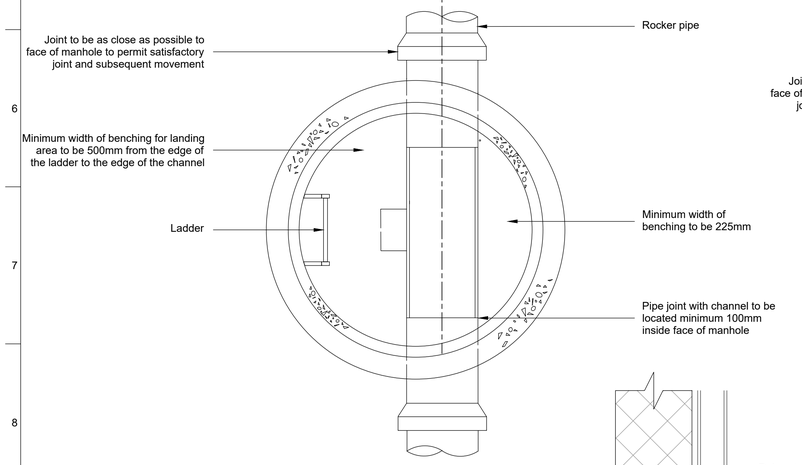






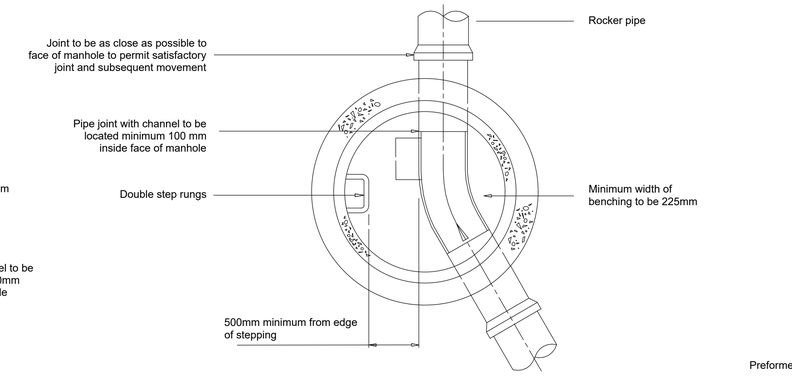
Typical Inspection Chamber Detail - Type 3 (Rigid material detail)

Maximum depth from cover level to soffit of pipe in areas subject to vehicle loading 3m, non-entry
Not to Scale



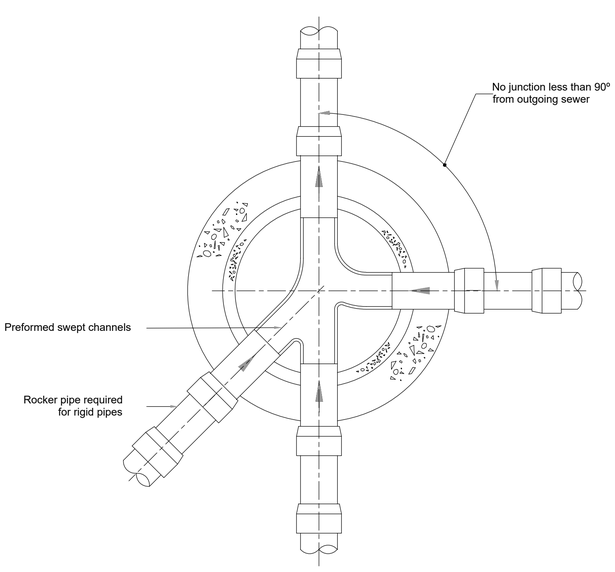
Typical Manhole Detail - Type 1A

Depth from cover level to soffit of pipe 3 m to 6 m
Not to Scale



Typical Manhole Detail - Type 2

Maximum depth from cover level to soffit of pipe 3.0 m
Not to Scale



Sectional Plan

Rigid pipes built into manhole should have a flexible joint as close as feasible to the external face of the structure and the length of the next rocker pipe should be as shown.

Nominal diameter (mm)	Maximum effective length (m)
150 - 600	0.6
601 - 750	1.00
over 750	1.25

All pipes entering the bottom of the manhole to have soffits level.

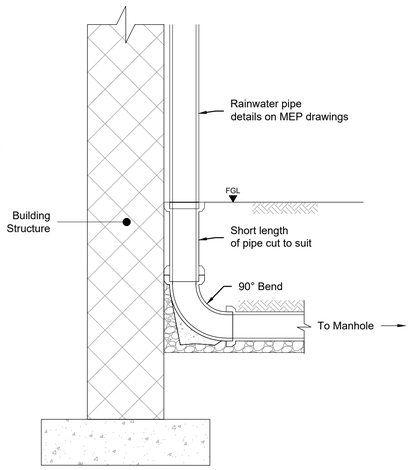
Typical Arrangement Of Pipe Junctions Within Manholes

Manhole Covers

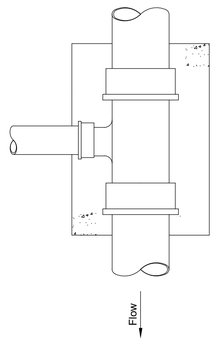
Minimum Cover Depth	Trafficable Area (mm)	Non-Trafficable Area (mm)
Foul Water	1200	900
Surface Water	1200	900

Manhole Diameters

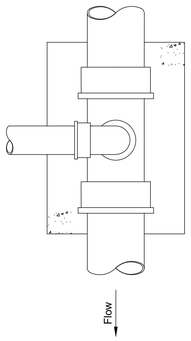
Nominal internal diameter of largest pipe in manhole (mm)	Minimum nominal internal dimension of manhole (mm)
Less than 375	1200
375 - 450	1350
500 - 700	1500
750 - 900	1800
Greater than 900mm	Pipe diameter + 900mm



Rain Water Pipe interface Detail



Plan



Plan

NOTES

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13 Fitzroy Street
London W1T 4BQ
Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924
www.arup.com

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Job Title
Haverstock Hill

Key Plan

Drawing Title
Proposed Drainage Details Sheet 1

Scale at A1 1:200

Discipline Civil

Job No **268265-00**

Drawing Status **For Information**

Drawing No **HH-ARP-DR-C-1010** **P01**

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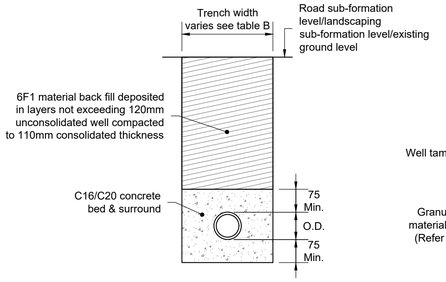
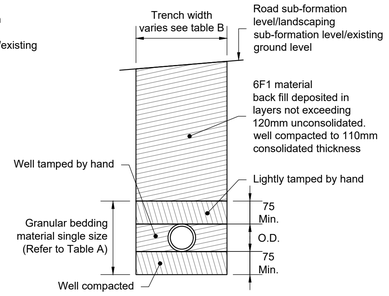


Class 'A' drainage pipe concrete bedding and surround detail



Class 'S' drainage pipe bedding detail

Pipe Dia.(mm)	Trench Width	
	Max	Min
150	600	490
225	700	580
300	750	680
375	1050	950
450	1150	1030
525	1200	1120
600	1350	1240
675	1450	1330
750	1500	1400
825	1600	1490
900	2100	1900
975	2150	1950
1050	2250	2050
1200	2500	2250
OVER 1200	O.D.+1000	O.D.+800

TABLE A

Note:
All excavation in excess of those stated shall be backfilled with pipe bedding material

Pipe Size	<300	300-800	>800
Sieve size	% by Mass passing	% by Mass passing	% by Mass passing
25mm	-	-	100
20mm	-	100	90-100
14mm	90-100	80-100	50-80
10mm	50-85	60-85	40-70
5mm	10-40	20-55	25-60
2.36mm	0-10	10-30	10-40
0.300mm	-	0-10	0-15

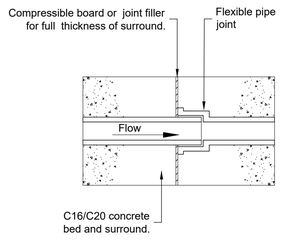
TABLE B

	Sand Grading (100% < 2mm)				
Use of Material	<2µm	<20µm	<63µm	<250µm	Organic content (%)
Sand fpr use in trenches ("zand in zandbed")		<=3 *	<=15		<=15
* Proportion of 63µm: 10% to 15%					

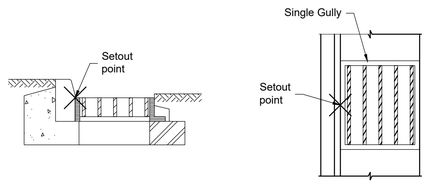
TABLE C

Pipe Material	
<400mm	uPVC
>400mm	Concrete

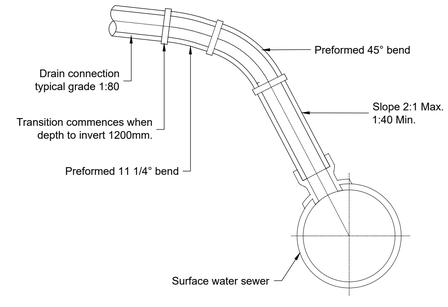
TABLE D



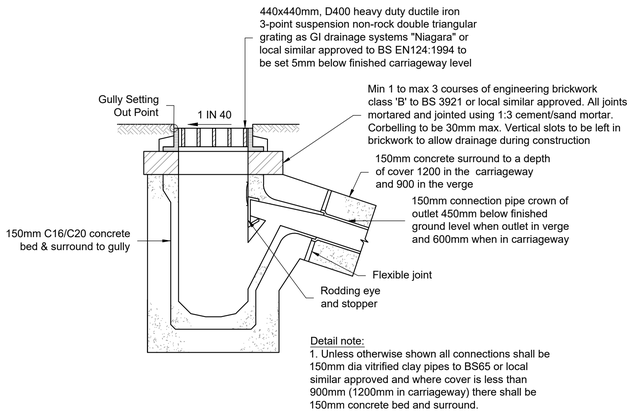
Flexible Joint for Concrete Surround Pipe Bedding and Surround



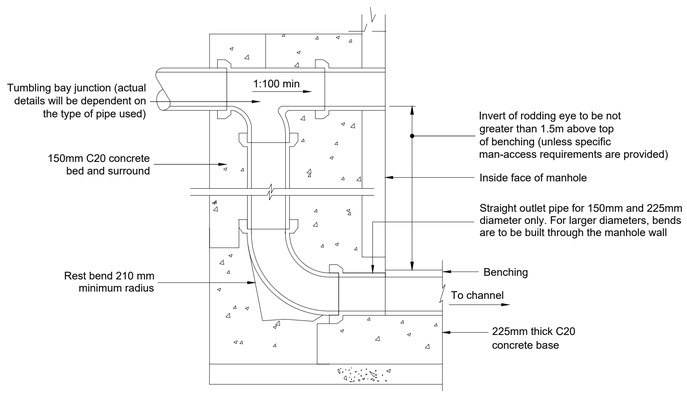
Typical Gully Setting out Point



Typical Gully Saddle Connection Detail



Surface Water Gully Detail



External Vertical Backdrop Detail

NOTES

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London W1T 4BQ
Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924
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Client
Best Star Real Estate 2

Job Title
Haverstock Hill

Key Plan

Drawing Title
Proposed Drainage
Details
Sheet 2

Scale at A1 1:200

Discipline Civil

Job No **268265-00**

Drawing Status **For Information**

Drawing No **HH-ARP-DR-C-1011** **P01**

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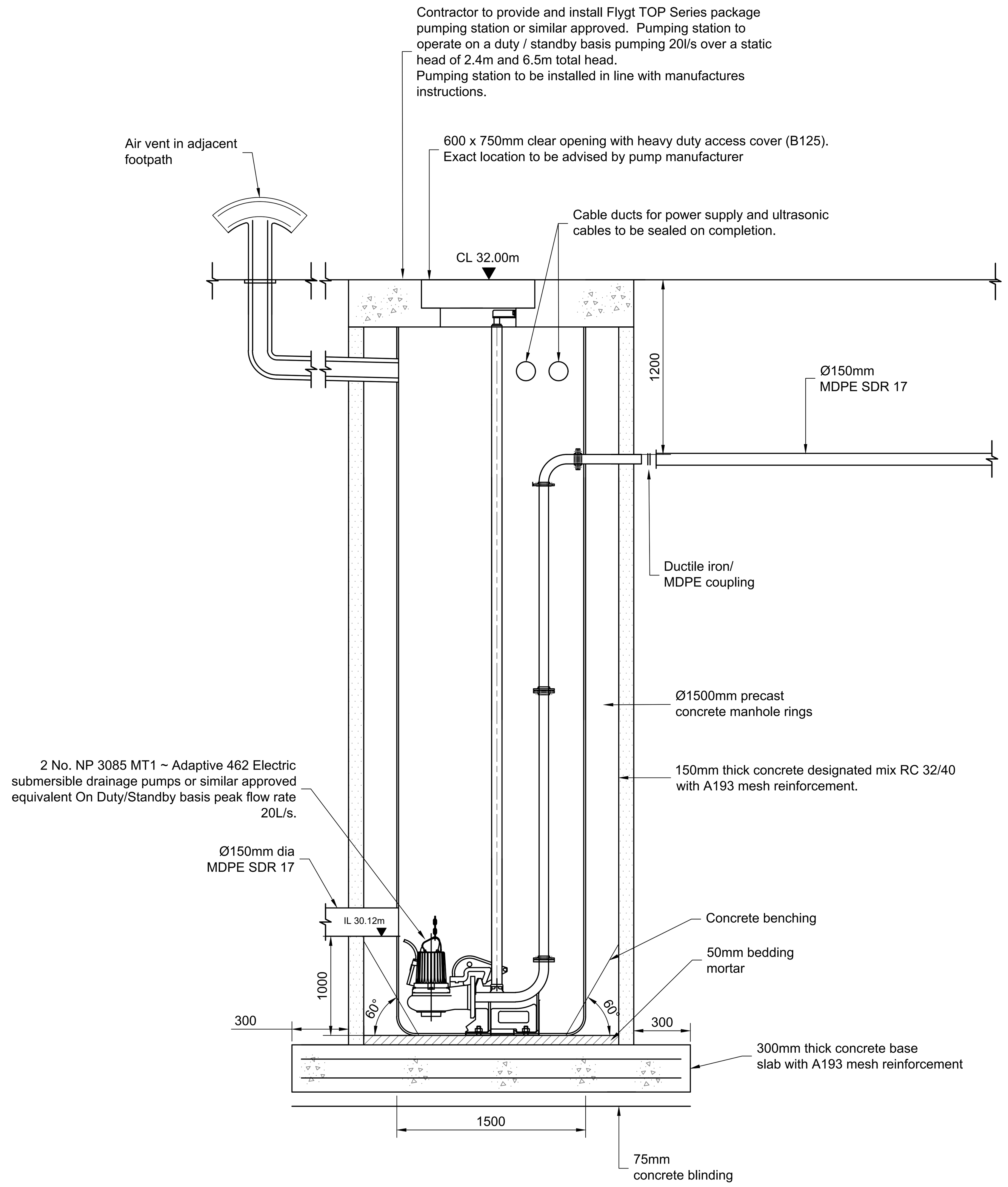
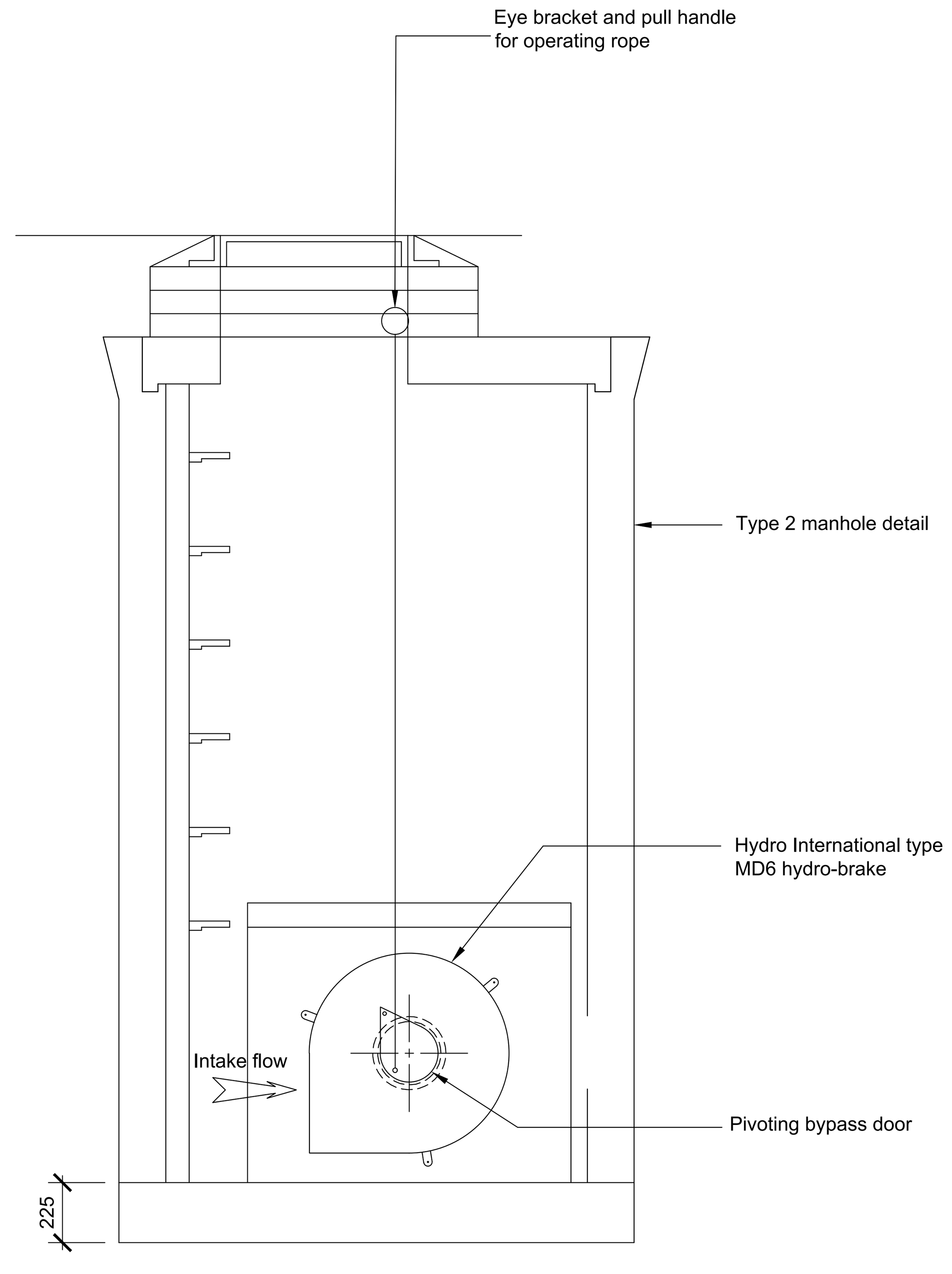
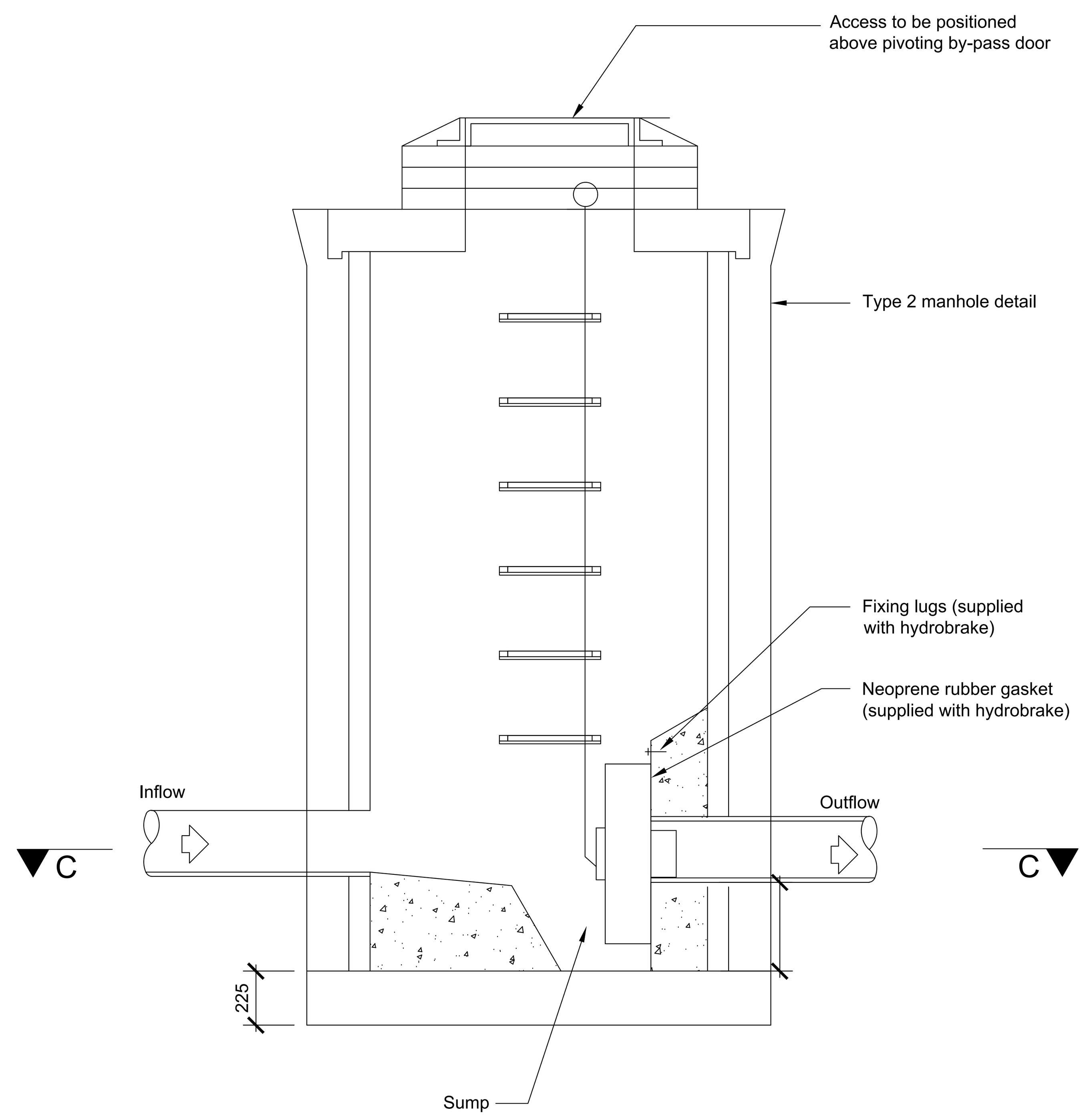


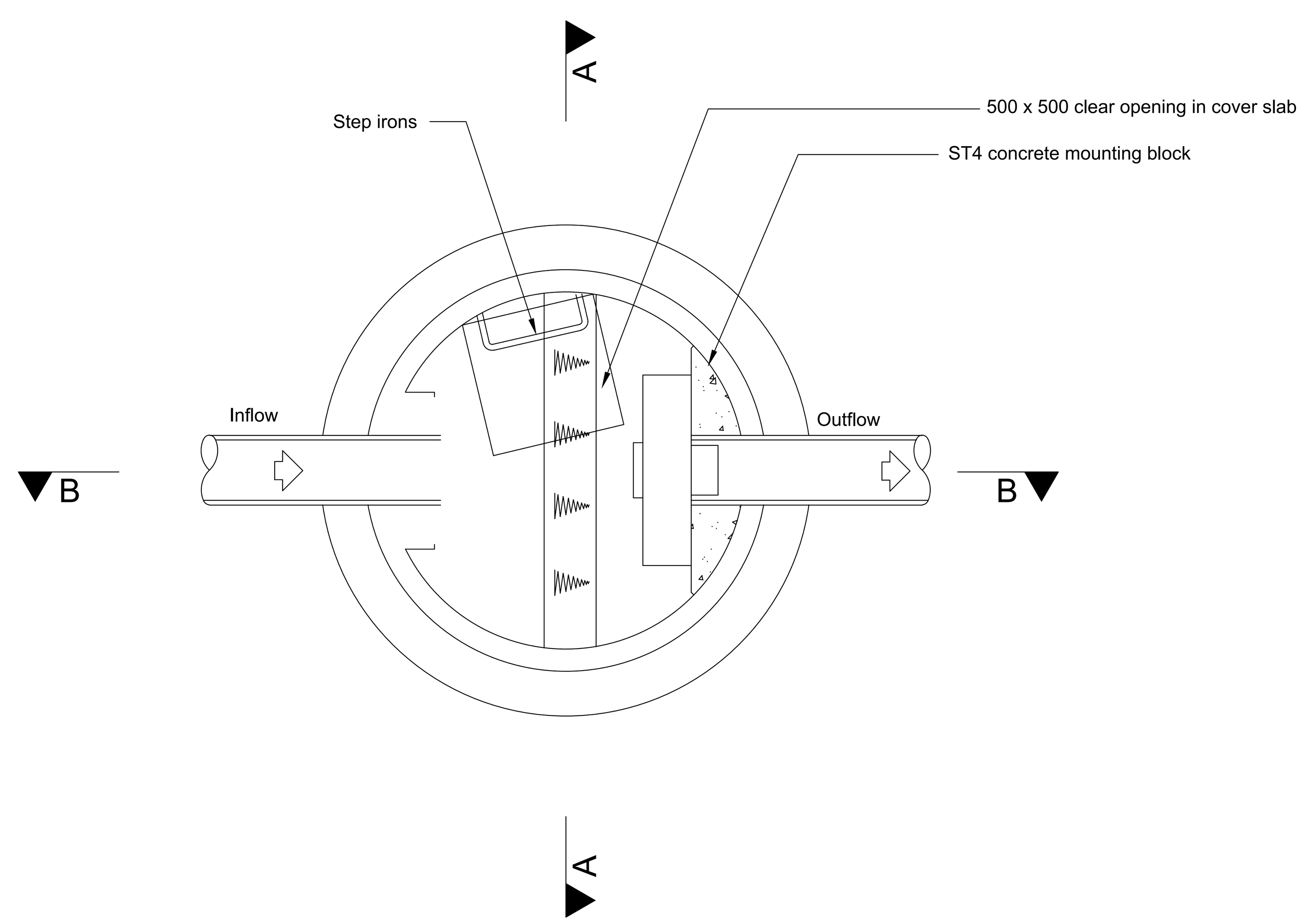
Typical Pumping Station Detail
Not to Scale



Section A-A

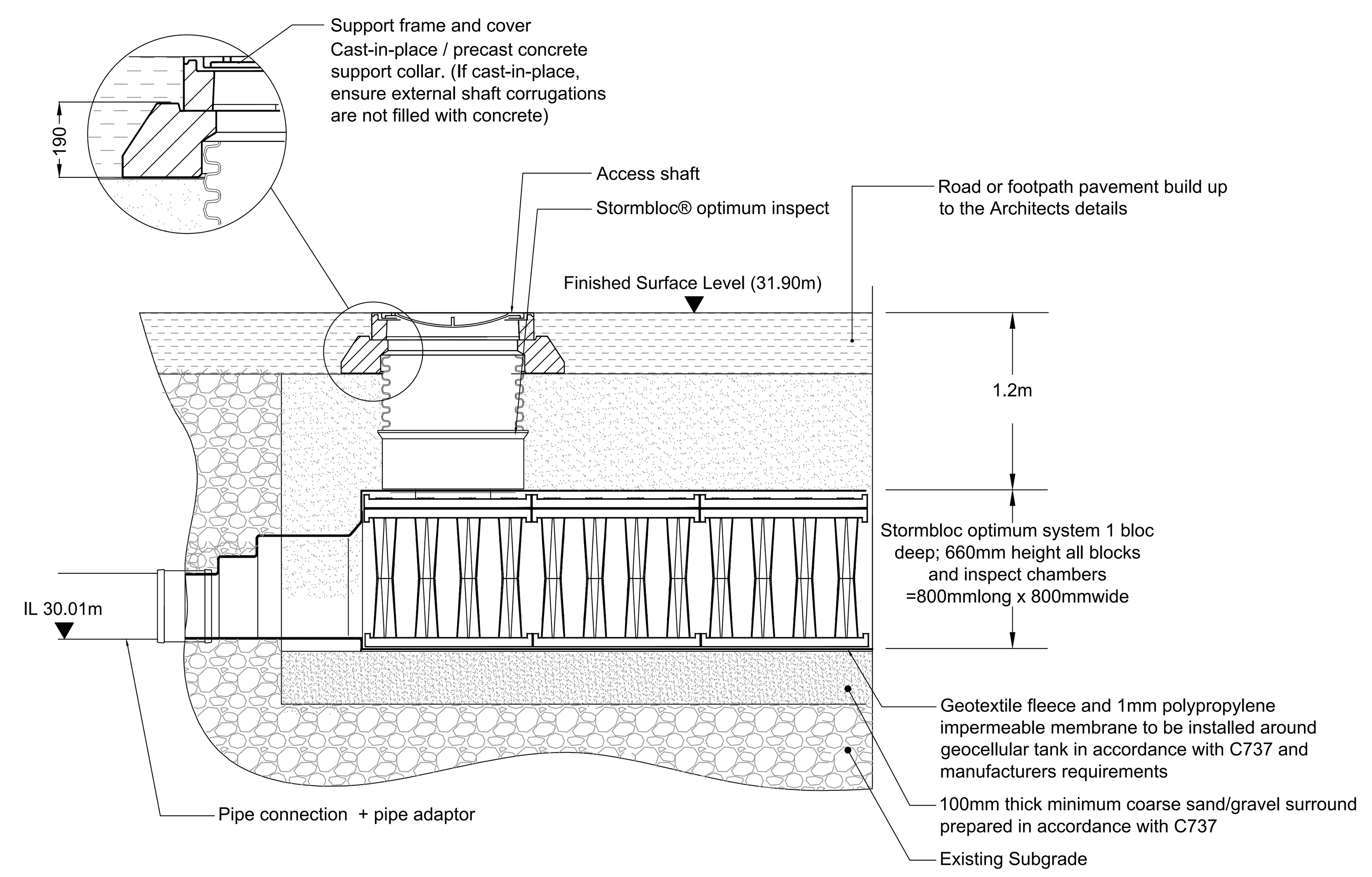


Section B-B



Section C-C

Hydro-Brake Detail for Outfall
Not to Scale



Typical Cellular Attenuation Tank Detail
Not to Scale

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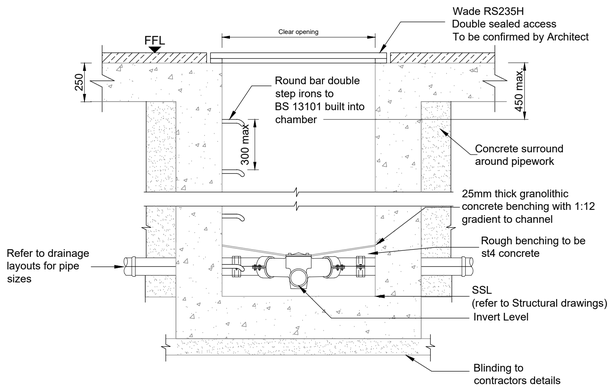
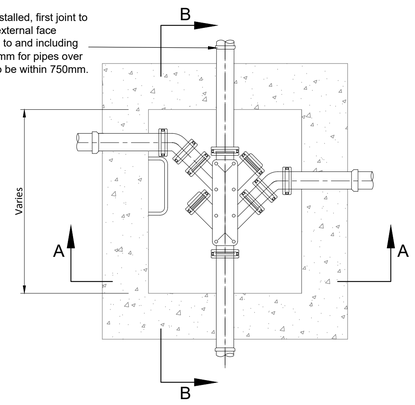
SECTION A-A

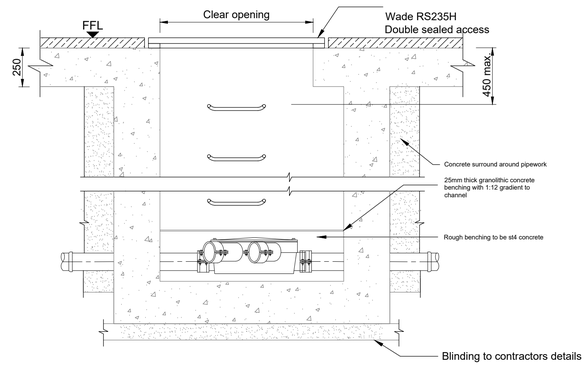


PLAN

If rocker pipe to be installed, first joint to be within 150mm of external face chamber for pipes up to and including 150Ø and within 300mm for pipes over 150Ø. Second joint to be within 750mm.



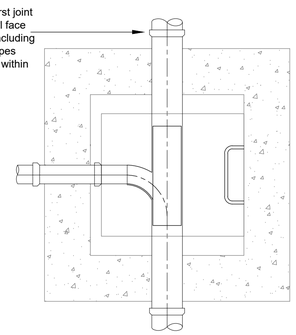
SECTION B-B



TYPICAL INSITU MANHOLE WITH CAST IRON CHAMBER CONNECTIONS

PLAN

If rocker pipe to be installed, first joint to be within 150mm of external face chamber for pipes up to and including 150Ø and within 300mm for pipes over 150Ø. Second joint to be within 750mm.



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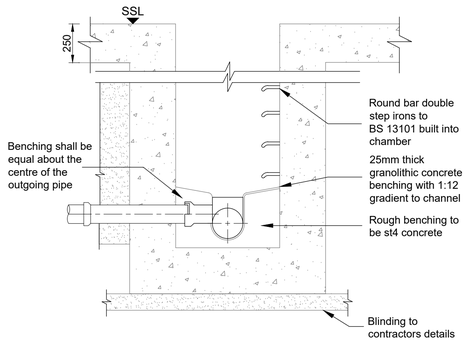
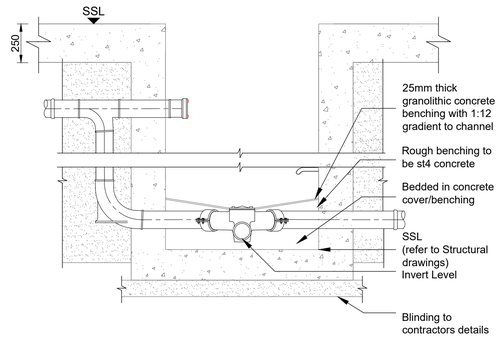


INSITU MANHOLE WITH OPEN CHANNEL (LESS THAN 3.0M. TO TOP OF PIPE CROWN)

SECTION



Max. Lower Pipe Dia	Trench Width Bd max
Ø100	525mm
Ø150	600mm

TYPICAL DETAIL VERTICAL BACKDROP INTO MANHOLE

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Sheet 4

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Discipline Civil

Job No **268265-00**

Drawing Status **For Information**

Drawing No **HH-ARP-DR-C-1013** **P01**

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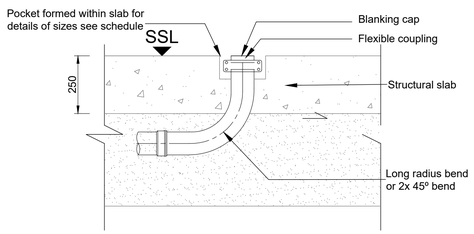
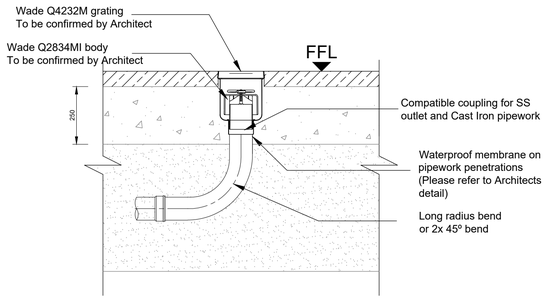
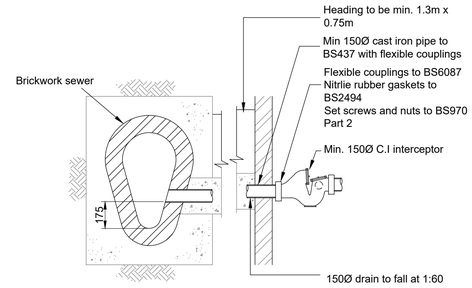


DRAIN SIZE DIA mm	POCKET SIZE		
	LENGTH mm	WIDTH mm	DEPTH mm
100	200	200	100
150	300	300	100

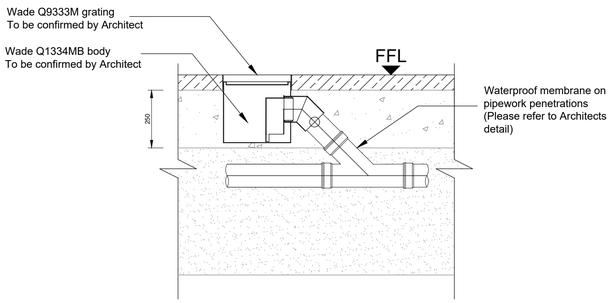
TYPICAL CAST IN DRAIN PIPE PENETRATION THROUGH SLAB FOR FUTURE CONNECTIONS



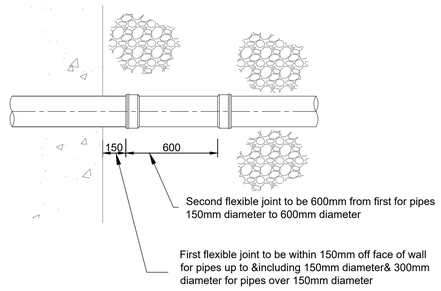
TRAPPED FLOOR GULLY



CONNECTION TO CORPORATION OF LONDON SEWER

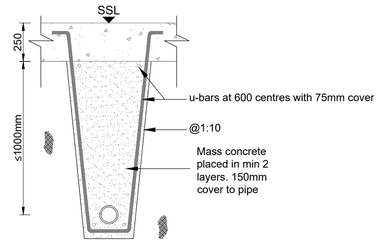


TRAPPED FLOOR GULLY FOR TOILET AREA



Note:
Rocker pipes required to be installed at manholes where pipes pass through structures and where pipes leave concrete bed and surround.

ROCKER PIPE DETAIL



Note:
Detail shows trenching for single pipe runs. Dimensions and reinforcing will vary for situations where more runs are combined.

UNDERSLAB DRAINAGE TYPICAL SUPPORT FOR SINGLE PIPE RUNS

NOTES

1. All dimensions are in millimetres unless otherwise noted.
2. Unless otherwise indicated, all construction details shall comply with 'Sewers for Adoption' 7th Edition published by Water Services Association. For the purpose of this drawing, Thames Water standards have been used in the design.

Issue	Date	By	Chkd	Appd
P01	23/10/20	TB	RO	TMcD
For Information				

ARUP
13 Fitzroy Street
London W1T 4BQ
Tel +44(0)20 7636 1531 Fax +44(0)20 7580 3924
www.arup.com

Client
Best Star Real Estate 2

Job Title
Haverstock Hill

Key Plan

Drawing Title
Proposed Drainage Details Sheet 5

Scale at A1 1:200

Discipline Civil

Job No **268265-00**

Drawing Status **For Information**

Drawing No **HH-ARP-DR-C-1014** **P01**

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Do not scale

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File Note

268265-00 15 October 2020

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Raluca Olariu	Tristan McDonnell	Tristan McDonnell
Signature