

Our Reference : D2972-L-01
Your Reference :

24 February 2022

Peter Waring
J Waring & Sons Ltd
Belfold Canal Bridge
Moorside Lane
Woodplumpton
PR4 0TB

Dear Peter,

Former TVR Factory – Phase 2 Development
Foul and Surface Water Drainage Design

PSA Design have been instructed to undertake the detailed design of the foul and surface water drainage infrastructure for the redevelopment of the former TVR factory, off Bristol Avenue, Blackpool.

The scheme has been developed with reference to the Flood Risk and Drainage Strategy submitted as part of the original approved planning application.

Background

The site is being developed in two Phases, Phase 1 is already constructed. This drainage design relates to the remainder of the site (i.e., Phase 2). The existing site was once completely developed and effectively 100% impermeable. This is shown on the aerial extract shown overleaf. In recent times parts of the site have slowly been demolished. The site as it stands today generally consists of old floor slabs and hardstanding areas to the east / south and occupied buildings and parking to the north west. This is also shown on an aerial extract included overleaf. The current impermeable measure circa 3000m².

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Bristol Avenue Site (Photo taken 2002)



Current Bristol Avenue Site

The existing site currently drains to the private 375mm dia. combined sewer running westerly along Bristol Avenue. All the existing sewers are shown on PSA Drawing D2972-D-01. Historical land registry plans show the above sewer (marked as proposed) circa 1953. Existing surface water run-off from the existing buildings and parking areas (3000m²) is estimated to be circa 42l/s based on a 1 in 1yr storm. This is well within the capacity of the 375mm sewer.

BEK Environmental undertook an intrusive Phase 2 ground investigation. The report indicated variable ground conditions throughout the site with relatively high ground water strikes. The table below shows the ground water levels in each borehole monitored.

Borehole Location	Recorded Water Level (m bgl)
WS1	1.31 – 1.37
WS10	1.1 - 1.28
WS4	1.1 – 1.22
WS3	0.94 – 0.96
WS5	0.79 – 0.81

Since it is a requirement to have at least 1m between the invert of infiltration features and groundwater level, it will not be feasible to dispose of runoff by means of infiltration.

Desktop review of the area, online mapping and searches have not identified any open ditches or culverted watercourses in the area. PSA Design arranged a telephone meeting with Blackpool Council Engineer (Steven Anderson) to discuss potential drainage options available at the site and to gain an understanding of what the Council would expect in regards to surface water drainage. The main points taken from the call are set out below:-

Blackpool Council Engineer confirmed that they are not aware of any existing watercourses in the vicinity of the site other than that which is some **500m to the south east of the site** (as the crow flies) and in their opinion it would not be reasonable to discharge here given that:

- It would require access over 3rd party land; and/or
- It would require a significant amount private drainage infrastructure within the adopted highway;
- Ground levels at the watercourse are comparable to those within the site – hence a pumped solution would be required;
- The watercourse outfalls to a UU combined sewer at the junction of Moor Park Ave and Bristol Ave. Which in turn appears to head north eastwards via a tortuous route before returning westwards to combine (to the north of the site) with the box culvert combined sewer which runs along the western boundary of the development site.

The Council Engineer also stated “If the drainage is to connect to a UU asset any flow rate UU request would supersede the councils values. While the council would typically request a minimum betterment of 30% we do request an attempt to achieve greenfield runoff rates”.

The key figures in relation to surface water run-off are set out below.

Historical Site – 1.5ha = circa **210 l/s** (1 in 1yr)

Current Site – 0.3ha = circa **42 l/s** (1 in 1yr) – 30% betterment = **30l/s**

QBAR (based on 1.5ha) = **12.6l/s**

It is also important to note that existing run-off rates for design storm return periods (1 in 30 and 1 in 100) will be far greater than those estimated above.

The existing 375mm drain has been surveyed and found to accurately reflect the location and depth marked on PSA’s drawing. There is an existing adopted surface water sewer shown on the United Utilities mapping to the east of the site, however, there was no evidence of this during the site survey. Regardless, this is shown to directly outfall into the combined sewer close to the site in any event. It also appears to be flowing against the flow on the combined sewer it connects into.

Proposed Surface Water

It has been clearly demonstrated above that the only realistic option for draining surface water from the site is via the existing private combined sewer that currently serves the existing site.

This private combined sewer outfalls into a large 1450 x 1600 combined sewer to the northwest of the site within Bristol Avenue.

To assist in procuring an optimum SuDS drainage system, PSA Design commissioned SEL Environmental, a specialist in engineering environmentally sustainable surface water drainage solutions. SEL have designed a permeable block paved solution with voided subgrade to act as an attenuation system. Due to the nature of the ground and the fluctuating water table it will be necessary to line the entire permeable paved system with an impermeable membrane. The extents of the permeable pavement system is highlighted on PSA Drawing D2972-D-03.

The sub-surface system introduces a series of checkdams and flow controls to catch the surface water as it passes through the sub-grade. The surface water would ultimately outfall into the aforementioned existing 375mm dia private combined sewer at a controlled rate of 5l/s.

Roof water is drained via traditional rain water pipes which each outfall into a catchpit before entering the sub-grade of the permeable surface via a diffuser unit.

The surface water drainage layout, together with the associated calculations and details are included as **Appendix A**.

The system has been designed to accommodate the 1 in 100yr + 40% climatic change event. The calculations demonstrate the requisite storage requirement can be contained wholly within the on-site permeable paved system.

The designed system offers significant benefits compared to the existing, operational, brownfield site. **It delivers a system that not only reduces run-off to 60% LESS than equivalent greenfield run-off rate**, but also provides ecological and environmental benefits associated with permeable blocked paving via the surface water cleansing it naturally provides.

It has therefore been demonstrated that a surface water drainage system has been designed to meet and exceed NPPF, United Utilities and Local Authority requirements.

Proposed Foul Drainage

The proposed foul drainage system is shown on PSA Drawing D2972-D-01 with associated details on D2972-D-02.

Due to the topography of the site, pipe run distances required and minimum gradients, the system has been split into two outfall locations. Foul drainage to Units 5 has already been constructed as part of the Phase 1 scheme.

The formality of the final connections will be subject to United Utilities S106 applications. These will be progressed in due course.

A suitable foul drainage system has therefore been designed that meets with all current legislation and requirements.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'G Sanderson', is positioned below the closing text.

Graham Sanderson
PSA Design Ltd.

Appendix A

SEL Environmental Surface Water Design & Calculations

Item	Quantity	Unit	Notes
1	1	m	...
2	1	m	...
3	1	m	...
4	1	m	...
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100	1	m	...

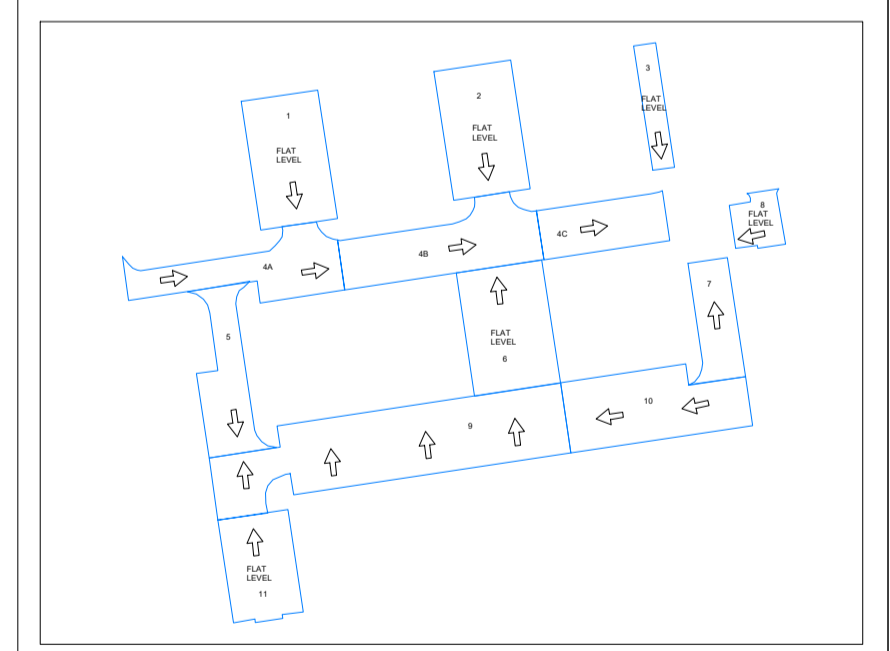


Legend

- RE Rodding Eye
- RWP
- WASP prefab chamber Ø1200
- VFC WASP prefab chamber with vortex flow control Ø1200 - 5 l/s restriction
- Pipework Ø150
- Inlet - PVOD Diffuser & WASP filter chamber for c.100m² catchment
- Inlet - PVOD Diffuser & WASP filter chamber for multiple 100m² catchment
- Outlet - Controflow SUDS02008 with diffuser, max. 3 l/s
- Outlet - Checkdam with collection and integral flow control
- Checkdam membrane only
- Voided sub-base attenuation layer minimum 1m deep, with impermeable membrane / protection fleece to base and sides
- Direction of surface flow

Attenuation

Reference	Type	Area (m²)	Storage (m³)
1	Voided Sub-base	487	143
2	Voided Sub-base	487	143
3	Voided Sub-base	134	40
4a	Voided Sub-base	432	128
4b	Voided Sub-base	529	157
4c	Voided Sub-base	304	91
5	Voided Sub-base	327	87
6	Voided Sub-base	430	156
7	Voided Sub-base	237	78
8	Voided Sub-base	120	44
9	Voided Sub-base	1162	404
10	Voided Sub-base	571	207
11	Voided Sub-base	358	130



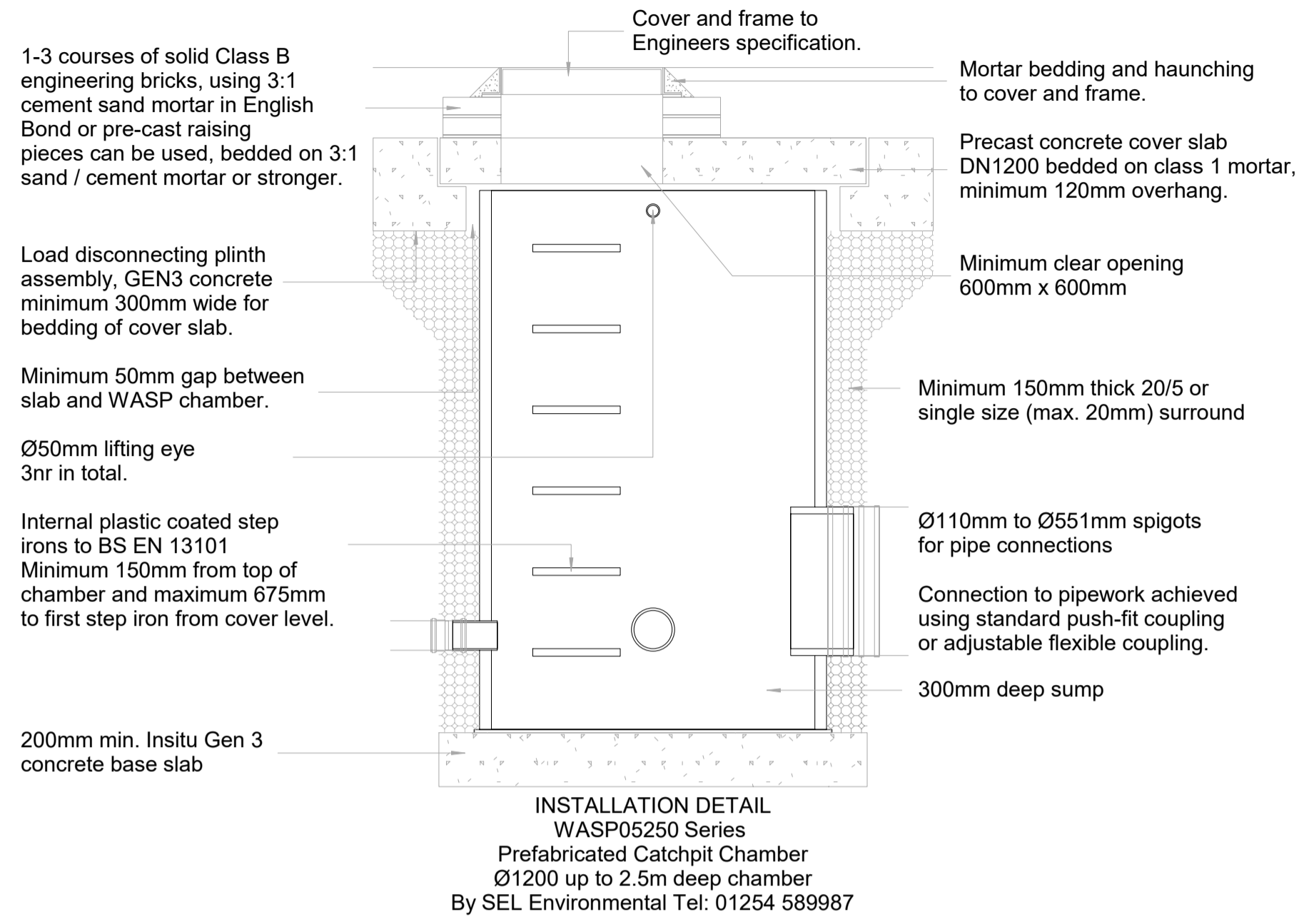
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Real Innovation
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Project: Bristol Road, Blackpool
Drawing Title: Surfacewater Layout
Client: PSA Design
Status: For Review

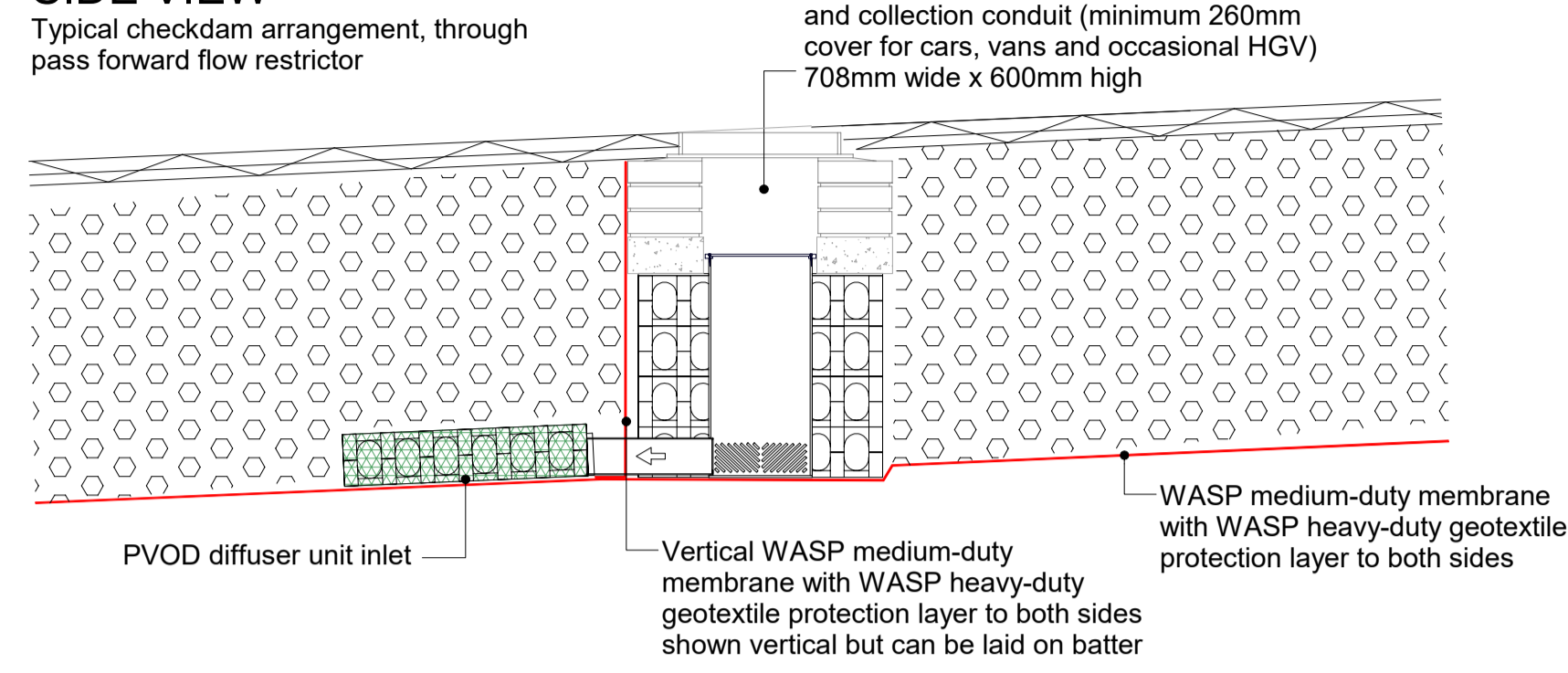
Rev	Date	Description	By	Chk

Scale: NTS **Paper Size:** TBC **Drawing Number:** TBC

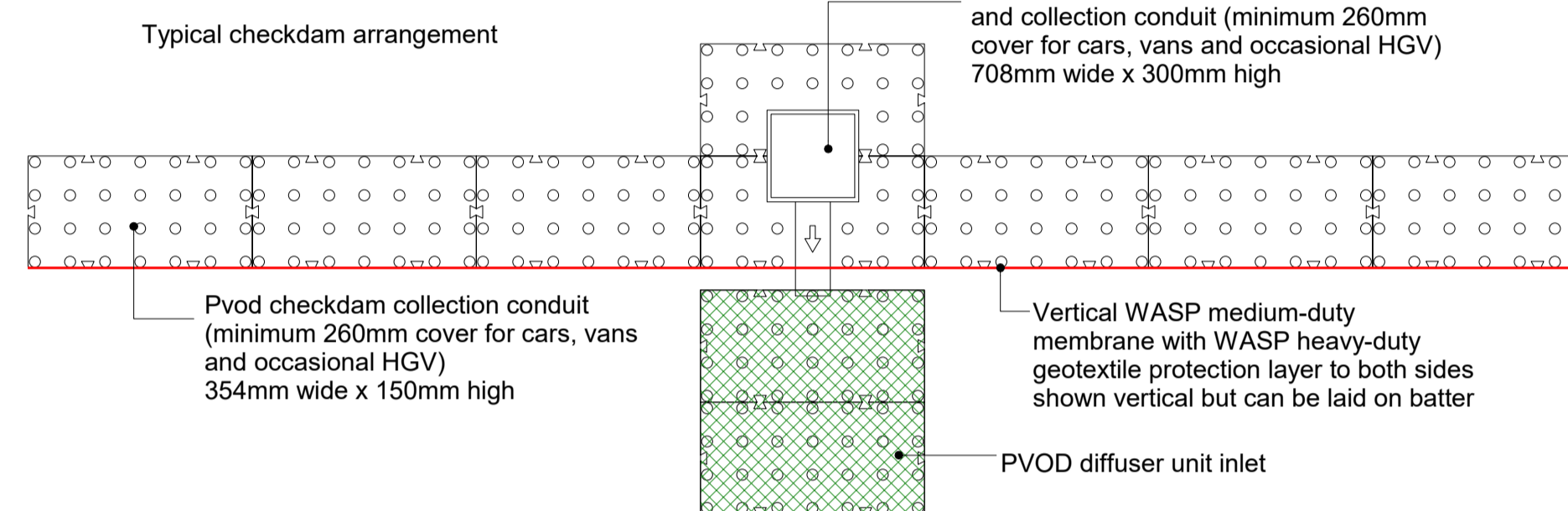
WASP CATCHPIT CHAMBER



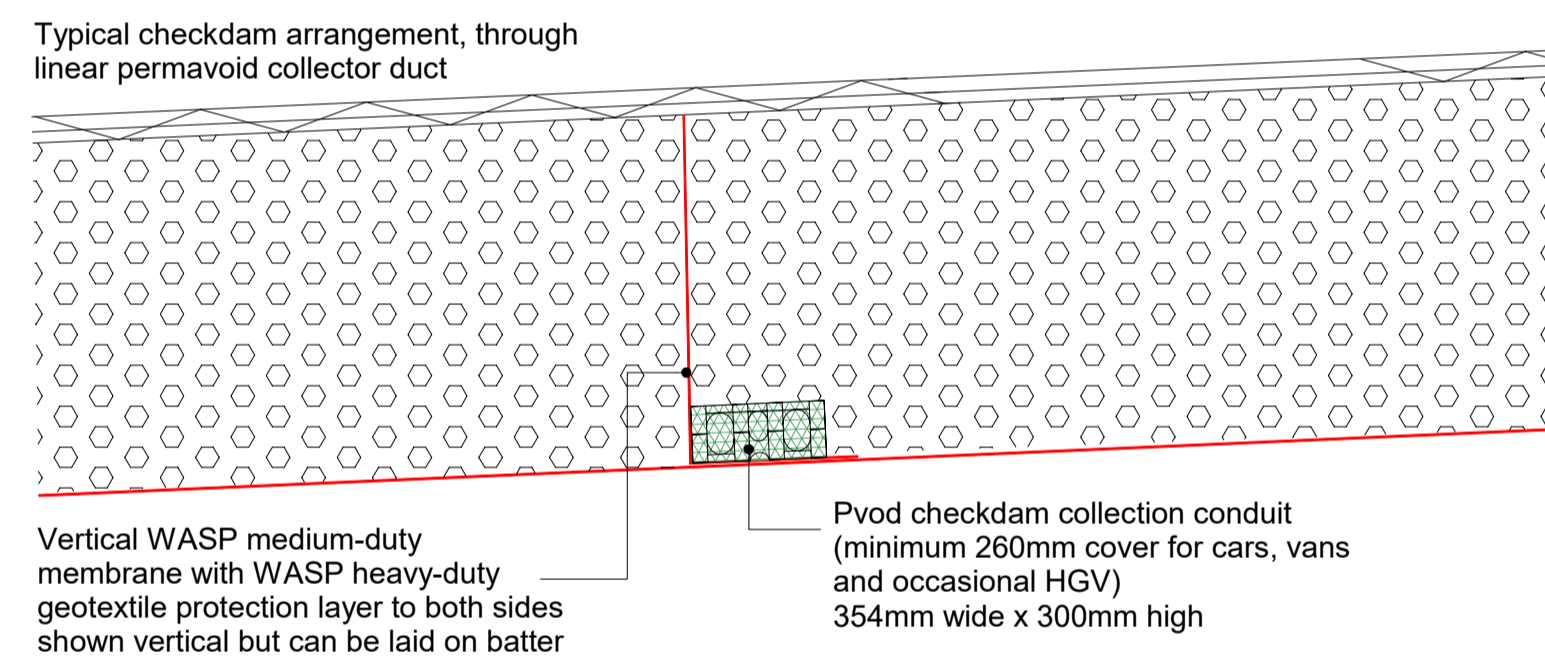
SIDE VIEW



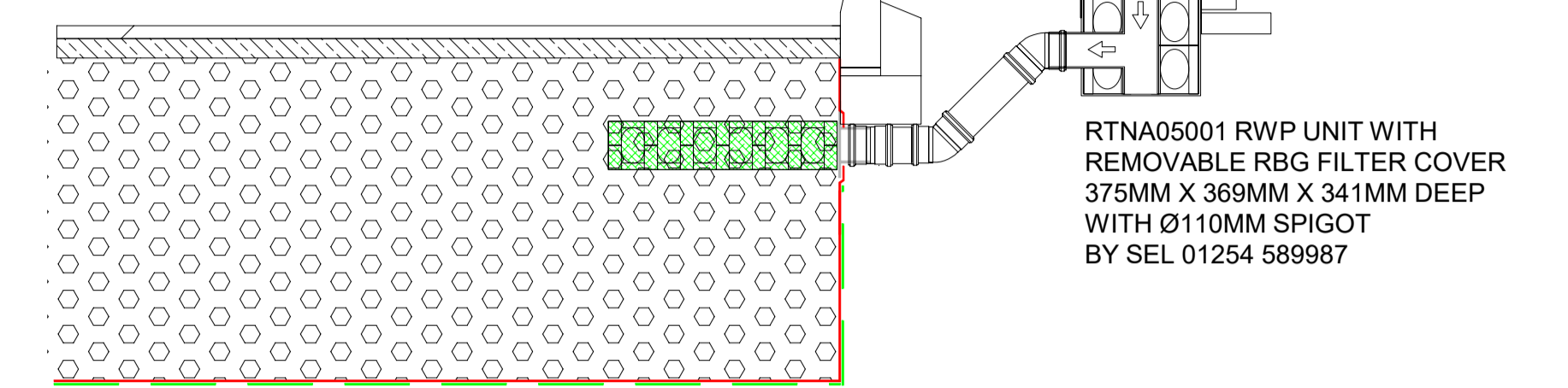
PLAN VIEW



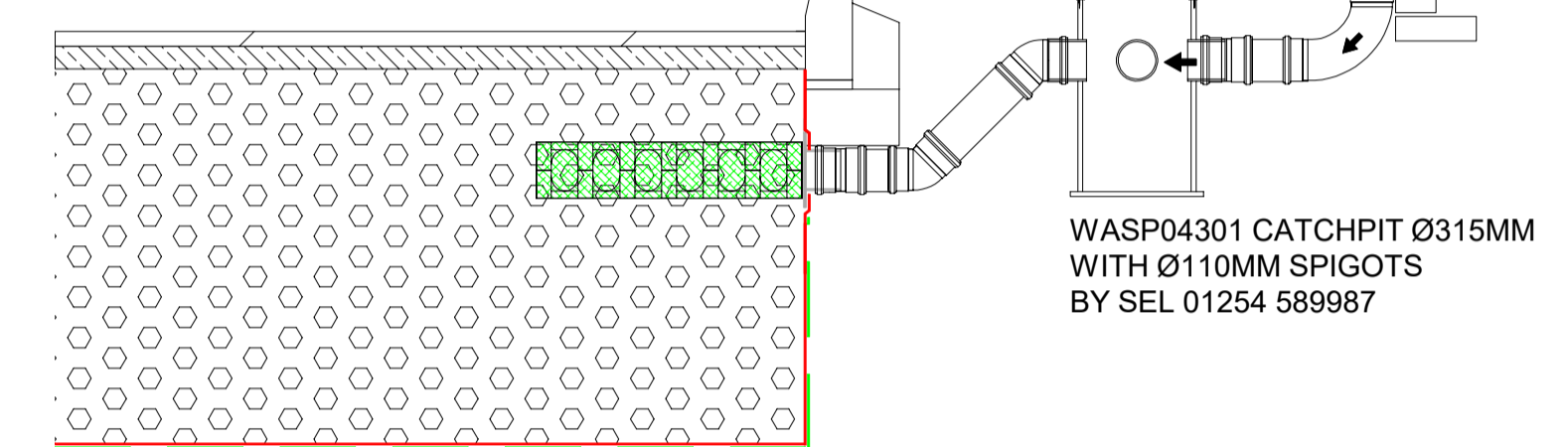
SIDE VIEW



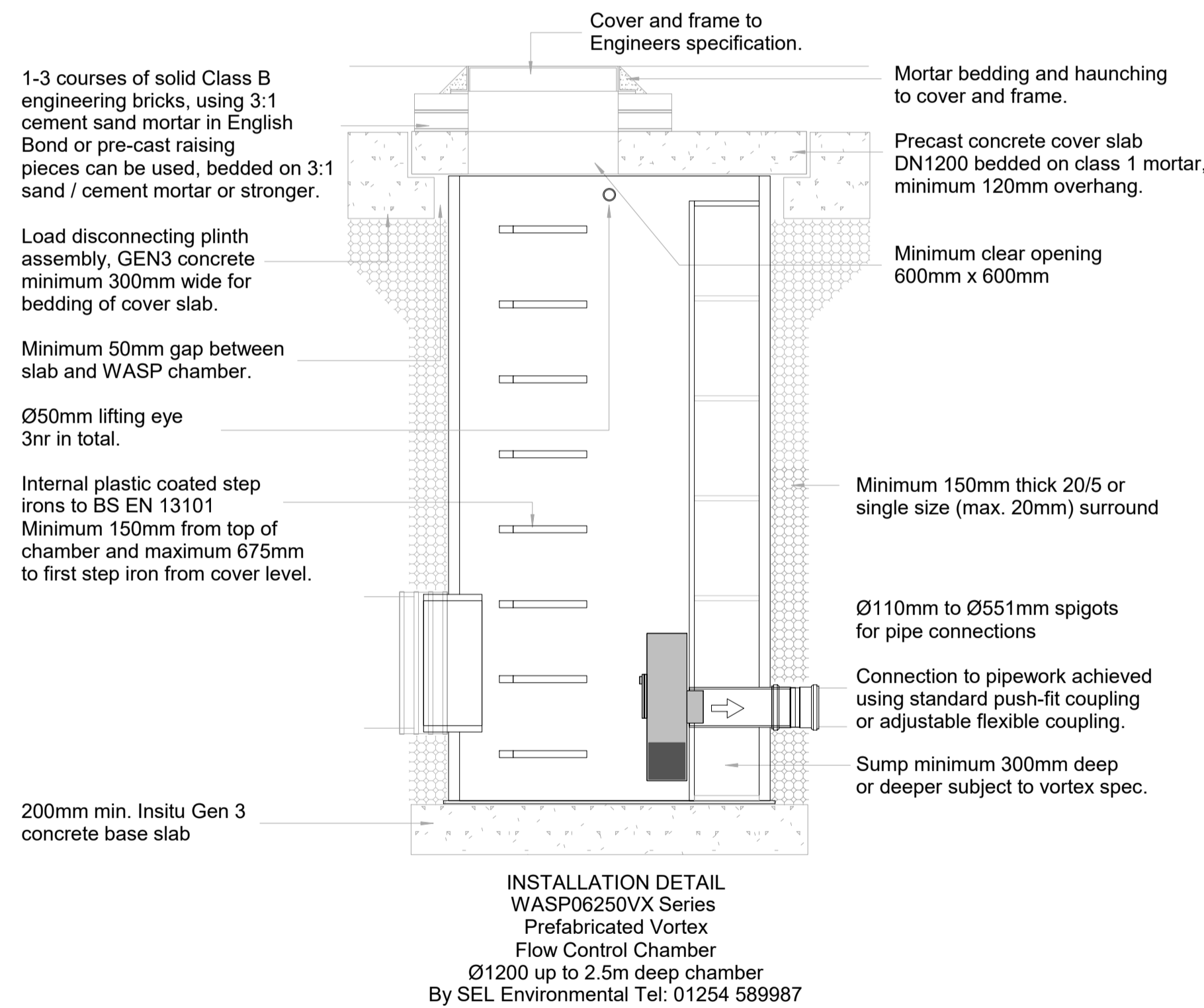
RWP INTO PARKING



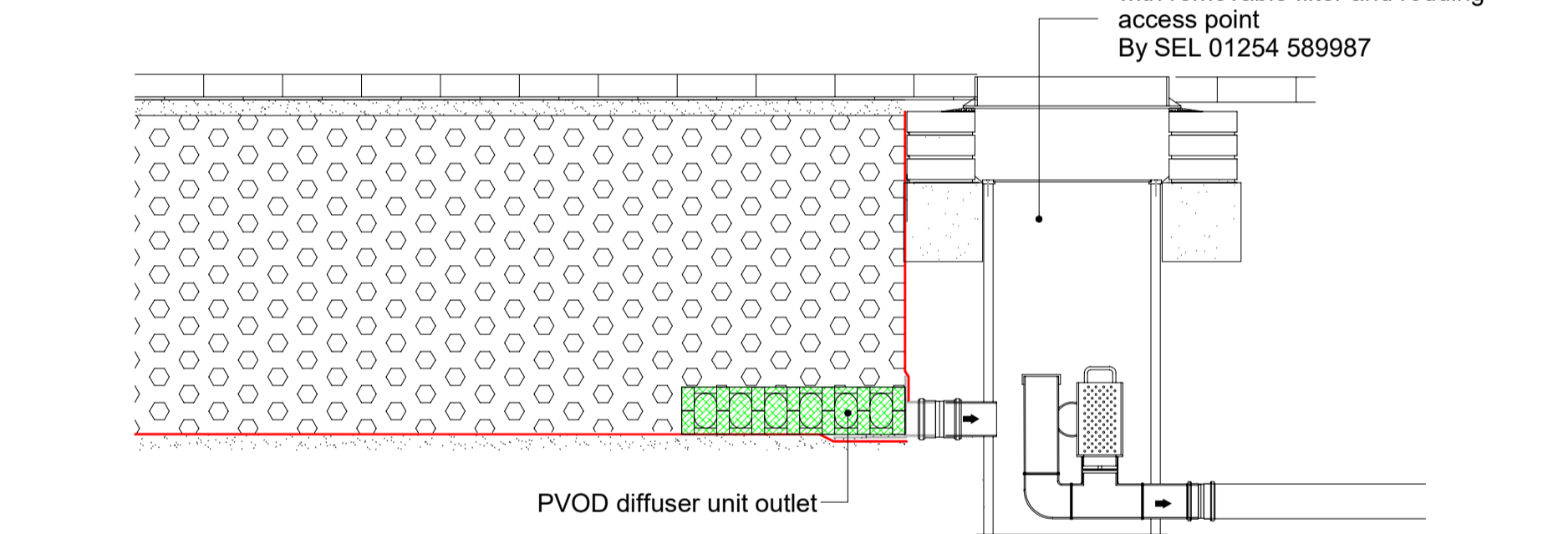
RWP INTO PARKING



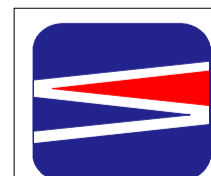
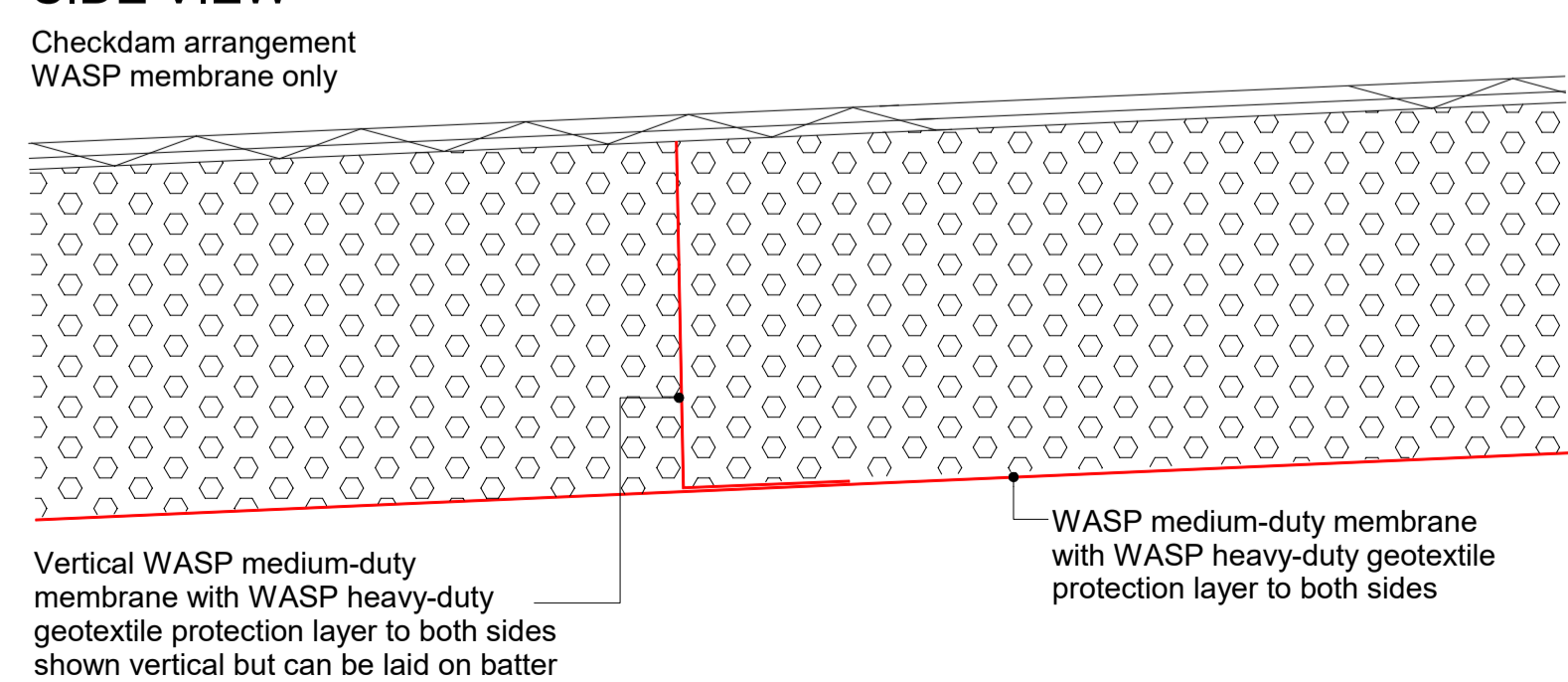
WASP VORTEX FLOW CONTROL CHAMBER



OUTLET FROM VOIDED SUB-BASE



SIDE VIEW



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Real Innovation

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Project: Bristol Road, Blackpool

Drawing Title: Surfacewater Layout

Client: PSA Design

Status: For Review

Rev	Date	Description	By	Chk
Scale		NTS	Paper Size	TBC
Drawing Number		TBC		



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Real Innovation.

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STORMWATER CATCHMENT ANALYSIS

Date: 03/02/2022 v2
Client: PSA Design
Project: Bristol Avenue, Blackpool

Registered Office: Canal House, Bonsall Street, Blackburn, Lancashire, BB2 4DD
Co Reg: 03740358 Vat No: 896 2451 85 Web: www.selel.co.uk Email: info@selenvironmental.com
Managing Director: A Shuttleworth Directors: T Murphy, M Lomax, M Gilsonan, L Warwick





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Date: 03/02/2022 v2
Client: PSA Design
Project: Bristol Avenue, Blackpool

Rainwater Catchment Area

Drawing ref: D2927-D-01 RevP1

Zone	Area m ²
Site - Red line boundary	16309
Soft landscaping	-495

Total	15814	m²
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Date: 03/02/2022 v2
Client: PSA Design
Project: Bristol Avenue, Blackpool

Site Layout





Date: 03/02/2022 v2
 Client: PSA Design
 Project: Bristol Avenue, Blackpool

Attenuation Requirement

Stormwater Management Version 8.03

File View About For Help Press F1

Tank1

Rainfall:

Return Period (years) Percentage Increase

Location Index MS-60 r

Outflow Details:

Infiltration rate (m/hr) Orifice Sizing Method

Design Flow (l/s) Orifice Dia (mm)

Orifice depth below tank (m)

Results:

Critical duration

Critical rainfall (mm/h)

H max (m)

Required Volume (m³)

Half empty time

	5min	10min	15min	30min	45min	1hour	6hour
Storage Volume (m³)	251.593	380.776	466.765	626.198	726.564	800.528	1267.52

Tab Tank1 Catchment Name

Catchment:

Area of Buildings (m²) x

Area of Dense Surfacing (m²) x Total Area

Other (m²) x

Storage Details:

Length (m) Porosity %

Width (m) Volume Increase %

Depth (m)

Tank Utilisation (All Storms)

Tank Behaviour in the Design Storm



Date: 03/02/2022 v2
 Client: PSA Design
 Project: Bristol Avenue, Blackpool

Attenuation Requirement

CRM Stormflow

Stormwater Management Software

Page 1

Client:	PSA Design
Project:	Bristol Avenue, Blackpool
Location:	Blackpool
Catchment:	Roofs and Hardstandings

Catchment Details:			Storage Details:	
Buildings	15814 m ²	x 95 %	Length	5578 m
Dense surfacing	0 m ²	x 90 %	Width	1 m
Effective Area	15023.3 m ²		Depth	0.95 m
			Porosity	30 %
			Area Increase	0 %

Rainfall Details - FSR Method:				Outflow Details:	
Return Period	100 years			Infiltration rate	0 m/hr
Climate Change Factor	40 %				
r value	0.35				
M5-60	19 mm			Attenuation Control	Orifice Plate
Summer Storm Profile				Control Diameter	49 mm
				Discharge rate	5 l/s
Duration	Intensity		Required storage(m³)	Result:	
	mm	mm/h		Outcome	Fail
5 min	16.8	201.2	251.593	Critical Storm Duration	36.57 hrs
10 min	25.4	152.4	380.776	Hmax	0.95 m
15 min	31.2	124.6	466.765	Required Volume	1589.572 m ³
30 min	41.9	83.8	626.198	Time to half empty	44.2 hrs
45 min	48.7	64.9	726.564		
60 min	53.8	53.8	800.528		
2 hours	66.7	33.3	984.949		
6 hours	88.2	14.7	1267.527		
24 hours	121.7	5.1	1561.924		



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Date: 03/02/2022 v2
Client: PSA Design
Project: Bristol Avenue, Blackpool

Attenuation Allocation

Drawing ref: D2927-D-01 RevP1

Attenuation requirement m³ 1590

Zone	Area m ²	Attenuation Req'd m ³	Comment
Permeable paving	5578	1590	Sub-base attenuation

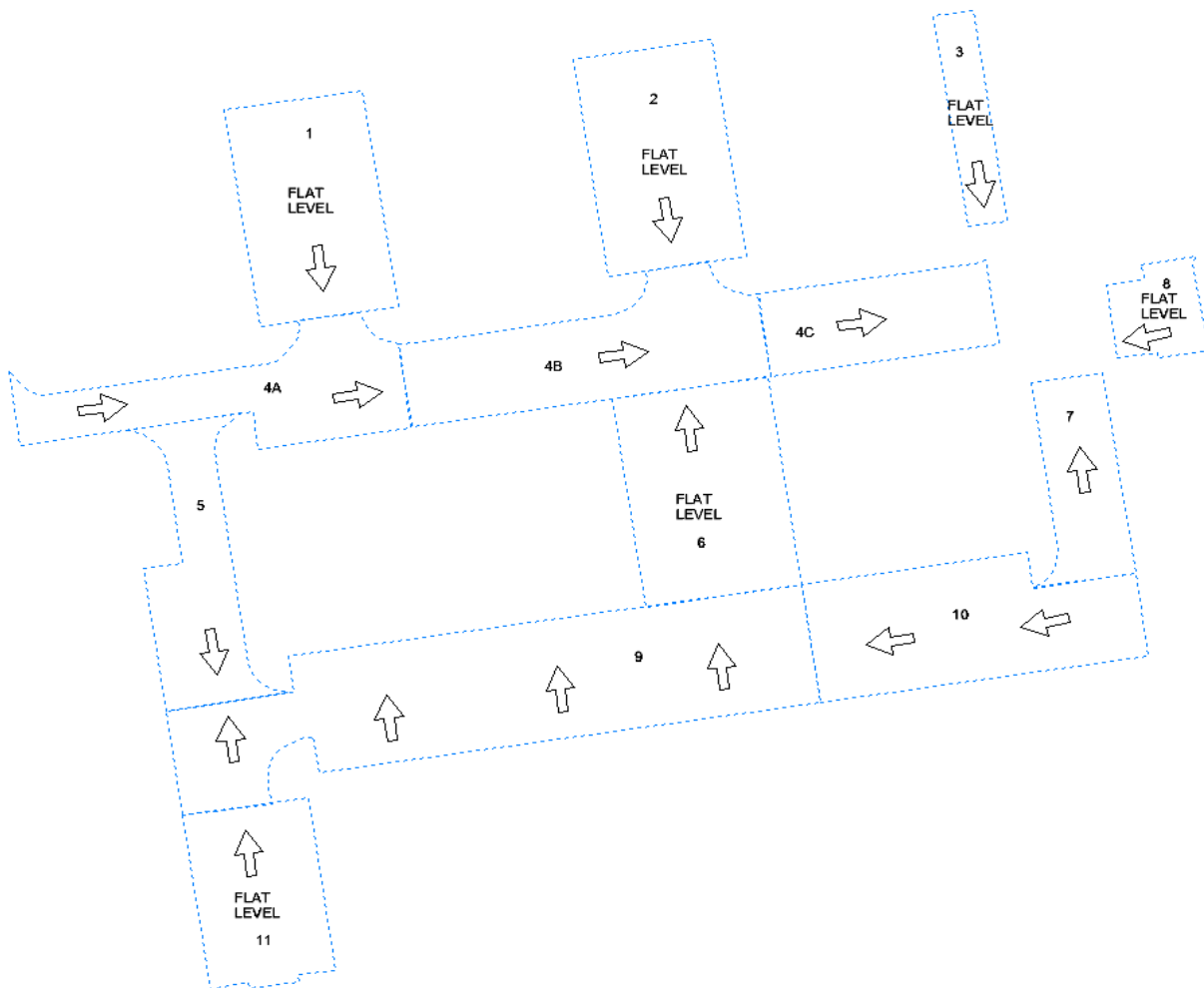
Zone	Area m ²	Voided Sub-base Thickness m	Storage m ³
Permeable paving - estimate c.95% efficiency due to site gradients	5578	1.00	1590



Date: 03/02/2022 v2
 Client: PSA Design
 Project: Bristol Avenue, Blackpool

Slope Attenuation Analysis

Ref	Slope Length m	Slope Width m	Surfacing Thickness m	Voided Sub-base Thickness m	Gradient	Attenuation (if flat) m ³	Attenuation (on slope) m ³	Efficiency	equivalent water depth mm
1	28.5	16.7	0.200	1.000	0.007	142.785	142.781	100.00%	300
2	28.5	16.7	0.200	1.000	0.007	142.785	142.781	100.00%	300
3	27.6	4.8	0.200	1.000	0.007	39.744	39.742	100.00%	300
4A	47.2	9.2	0.200	1.000	0.006	129.600	127.783	98.60%	296
4B	44.2	12.0	0.200	1.000	0.006	159.000	157.493	99.05%	297
4C	27.9	10.9	0.200	1.000	0.007	91.200	91.200	100.00%	300
5	36.9	8.9	0.200	1.000	0.015	98.400	87.014	88.43%	265
6	27.4	15.7	0.200	1.210	0.007	156.155	156.153	100.00%	363
7	26.3	9.1	0.200	1.210	0.022	86.902	77.645	89.35%	324
8	11.0	11.0	0.200	1.210	0.018	43.923	43.923	100.00%	363
9	15.6	74.5	0.200	1.210	0.026	421.806	404.376	95.87%	348
10	40.5	14.1	0.200	1.210	0.005	207.273	207.270	100.00%	363
11	22.7	15.8	0.200	1.210	0.009	130.208	130.208	100.00%	363

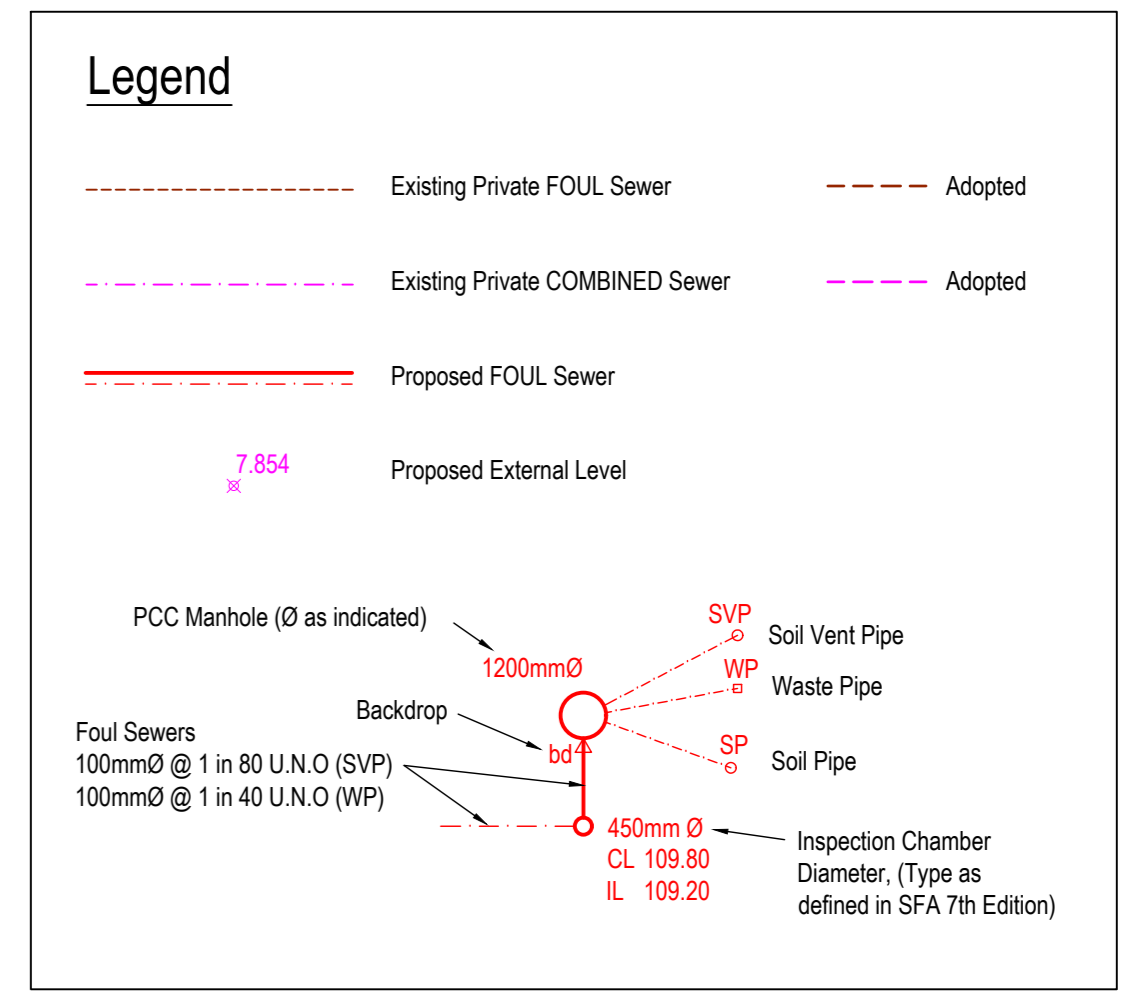
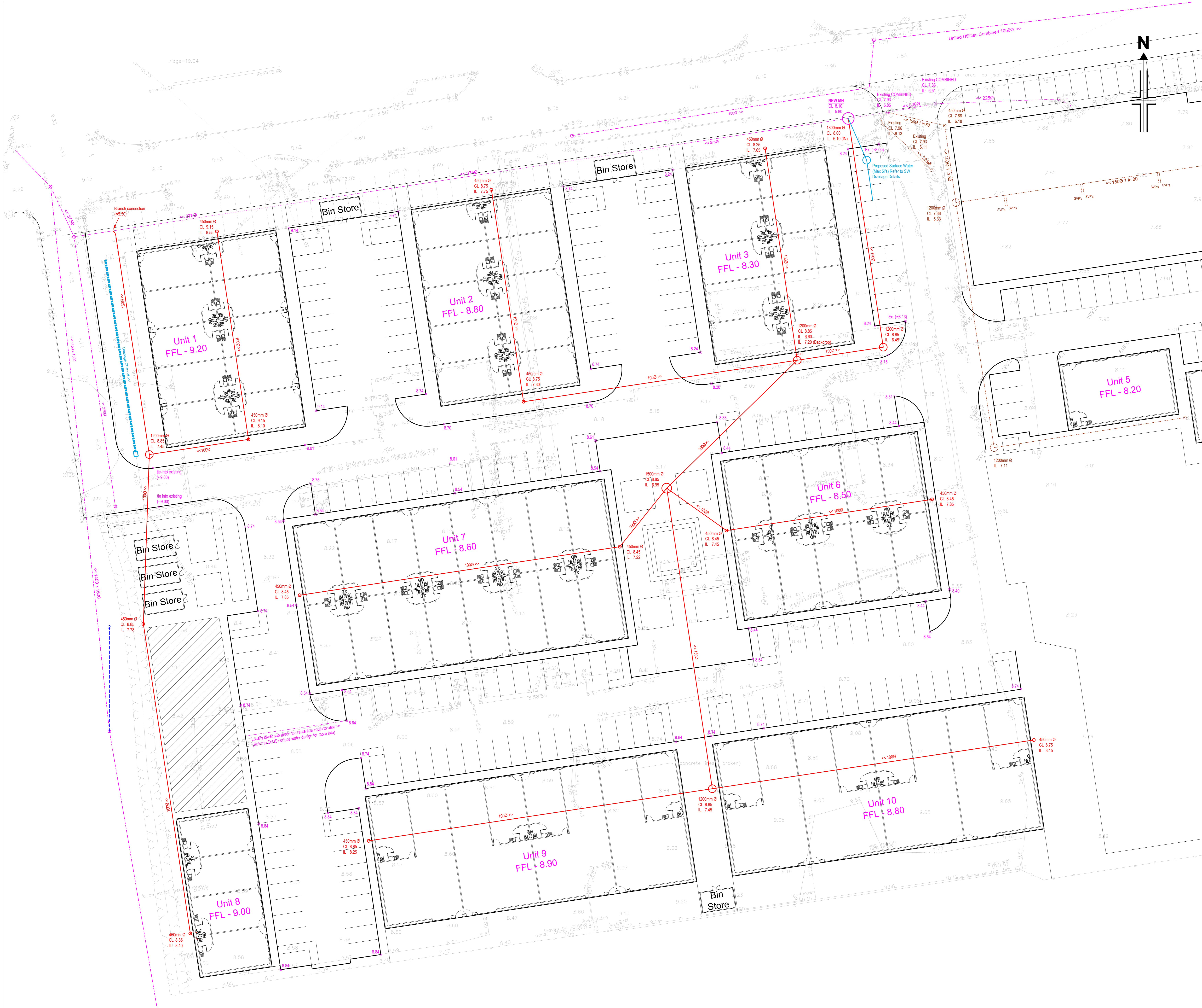




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End of Document

PSA Design Drawings

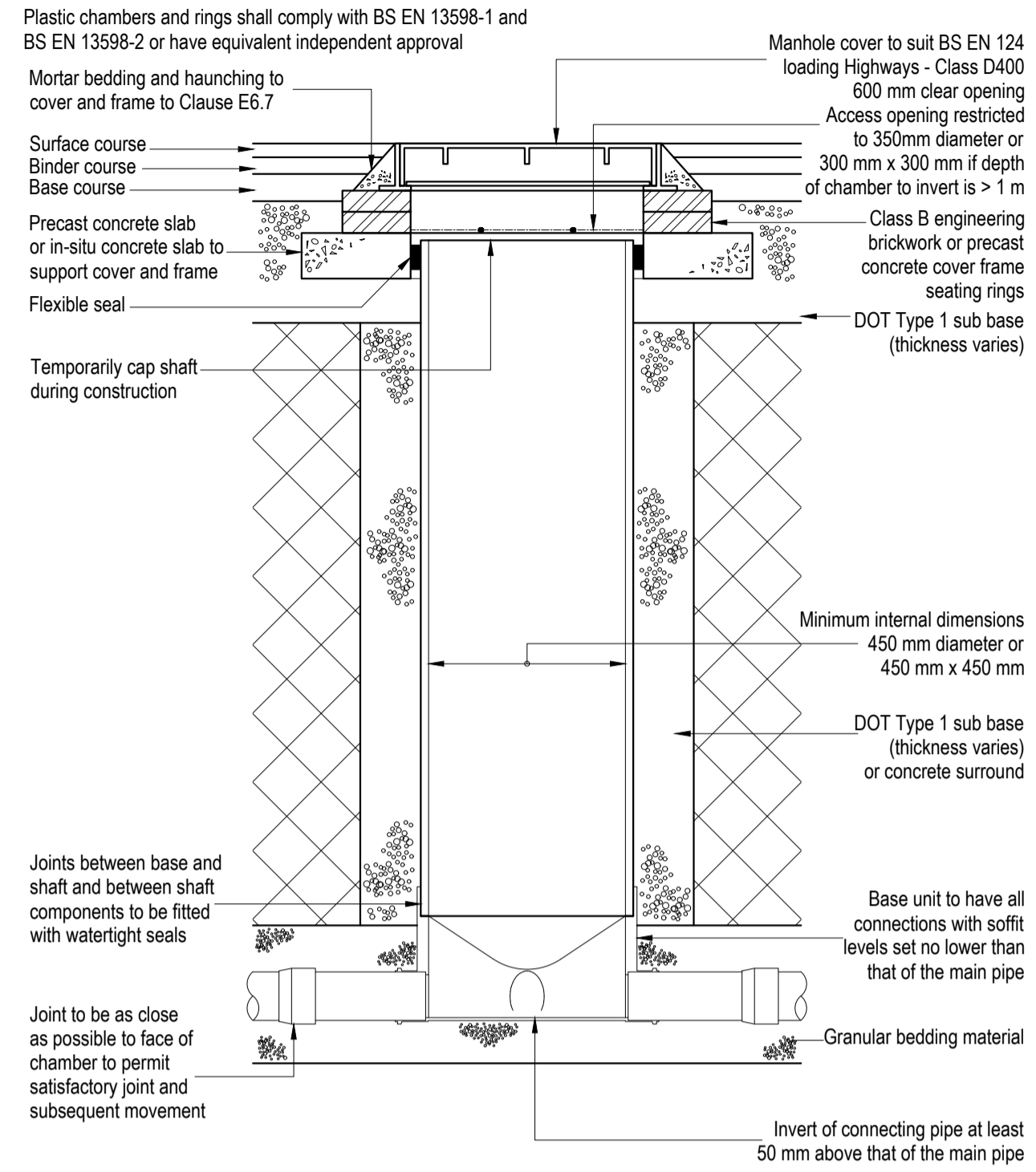


- ### Notes
- Do not scale from this drawing, work to levels and dimensions shown, if not available refer to notes, if in doubt refer to Engineer.
 - The Engineer shall be notified immediately, in writing, should any errors or discrepancies be found prior to the commencement or continuation of any works.
 - Drawing to be read in conjunction with all other scheme drawings and relevant specifications.
 - Contractor to be responsible for the location and protection of all existing services.
 - Work to be undertaken in accordance with Design and Construction Guidance for foul and surface water sewers (App Ver 2.0) and Building Regulations - Document H.
 - All existing land drains encountered on site during construction are to be re-connected/diverted as necessary (not connected into the new system without prior approval).
 - All drains to be laid soft to soil unless otherwise indicated.
 - Sleeper gradients may be used instead of backdrops.
 - Cover levels shown are approximate only and should be altered to suit finished surface levels.
 - Minimum depth of cover to crown of pipe without protection should be as follows:
 - 0.3m - Driveways, Parking Areas and Narrow Accesses with height restrictions to prevent entry by vehicles with a gross weight in excess of 7.5 tonnes.
 - 0.9m - Driveways, Parking Areas and Narrow Accesses with limited access to vehicles with a gross weight in excess of 7.5 tonnes, Agricultural land and public open space.
 - 1.2m - Other Highways and Parking Areas with unrestricted access to vehicles with a gross weight in excess of 7.5 tonnes.
 - All rainwater pipes (RWP) to be terminated at roddable gullies connected to a minimum 100mm dia. drain.
 - Unless stated otherwise or invert levels are provided, all surface water pipes to be minimum 100mm dia. laid at 1 in 100. Foul sewers to be minimum 100mm dia laid at 1 in 80 (1 in 40 if no WC connected).
 - Proposed PCC Manholes & Inspection Chambers and access points are to be as those defined in Design and Construction Guidance for foul and surface water sewers (App Ver 2.0), MH & IC diameters specified are minimum diameters and if necessary should be increased to accommodate minimum benching widths.
 - 450mm diameter IC's > 1.2m deep to include reducing ring to reduce opening to max 300mm Ø.
 - Pipes under cartway to be structured wall PVCu, Clay or Concrete in accordance with Design and Construction Guidance for foul and surface water sewers (App Ver 2.0). Plot drainage to be in accordance with Building Regulations - Document H.
 - Road gullies shall be trapped 450mm x 900mm deep with Class D 400 frame and grating to BS EN 124 unless otherwise approved. Outlets to be minimum 150mm diameter.
 - All drains in the vicinity of existing or proposed trees to be constructed in accordance with the requirements of NHBC.
 - Any drains passing through brick footings are to have c.c. inlets over and flexible joints either side. All drainage passing through external walls to have cement fibre sheet collars provided either side of wall to prevent vermin entry. All drains running under building to be encased in 100mm granular fill.
 - Where drain is within 1m of a building, the trench is filled with concrete up to the underside of the foundations and where the trench is further away than 1m from the building, the trench is filled with concrete to a level below the lowest level for the building equal to the distance from the building, less 150mm.
 - Installation of threshold drains to be the responsibility of the contractor in consultation with the scheme Architect. Threshold drainage should be installed where appropriate to ensure no surface water migration into properties. Where possible the contractor should ensure that private driveways are laid to disperse surface water to adjoining landscaped areas.
 - Drainage indicated on drawing around buildings spaced out for illustrative purposes, exact positions of drains may be altered to suit and determined on site prior to commencement of work (subject to maintaining minimum gradients and cover). Any revisions are to be subject to the approval of the Local Building Inspector and Structural Engineer.
 - Not all soil & rainwater pipes may be shown. Additional connections to be approved with Engineer, subject to minimum gradients and diameters.
 - All outfall levels and existing pipe levels should be checked prior to construction to ensure the design is deliverable and no clashes occur. Contractor to report any discrepancies to Engineer immediately.
 - Condition of any existing drainage to be used as part of proposed system to be checked prior to construction and any defects remedied.
 - All building drainage up to connection into chambers shown to be as per Architects Building Regulations drawings.
 - Channel drain covers to be suitable for intended loading and in accordance with Architects specification.

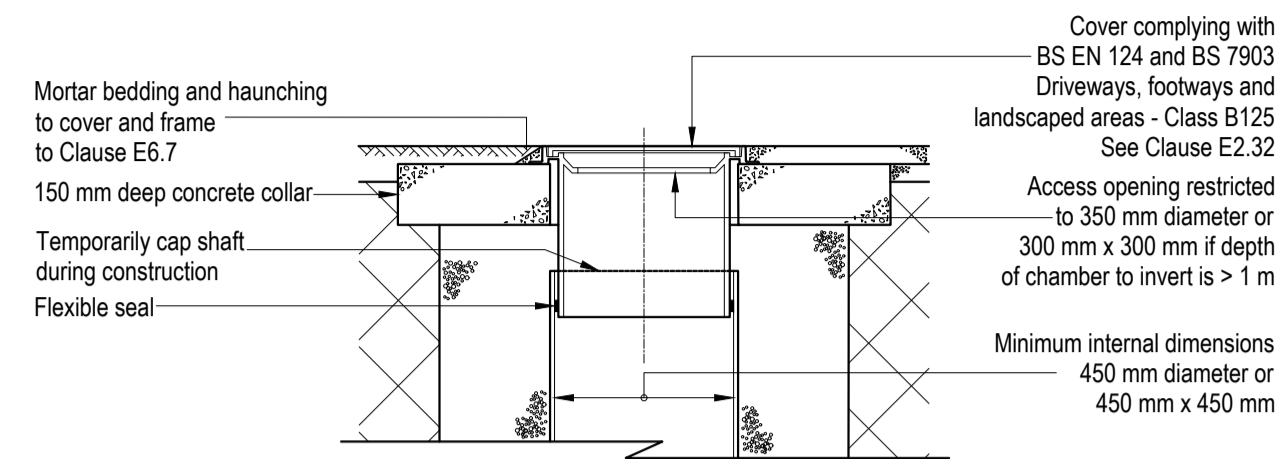
Please read all notes carefully.
 Depth & location of outfalls to be confirmed prior to commencement.
 Outfall connection subject to S106 Part 1 and 2 Approval.

P1	22-02-22	Preliminary for Comment	GS	D/W	GS
REV	DATE	AMENDMENT DETAILS	DRAWN	CHECKED	APPROVED
J Waring & Sons Ltd					
Bristol Avenue - Blackpool			Drwg No.	D2972-D-01	Rev.
Proposed FOUL Drainage			Scale	1:500	Sheet Size
				A0	
PSA Design Ltd The Old Bank House, 6 Berry Lane, Longridge, Preston, PR3 3JA Tel: 01772 786006 www.psadesign.co.uk mail@psadesign.co.uk			Date	22-02-2022	
PSA DESIGN			Drawn	GS	Checked
			Approved		

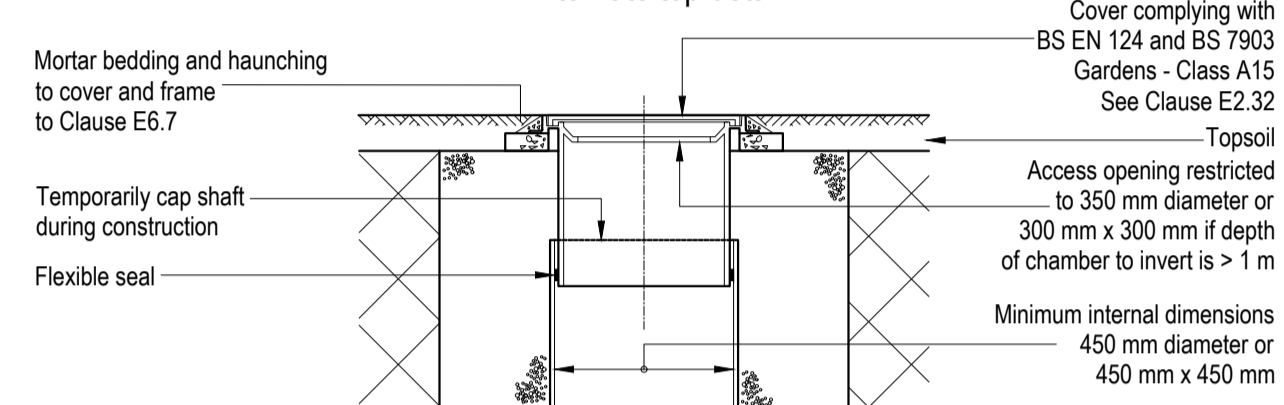
Inspection Chamber - (HV) (suitable for heavy vehicle loading)



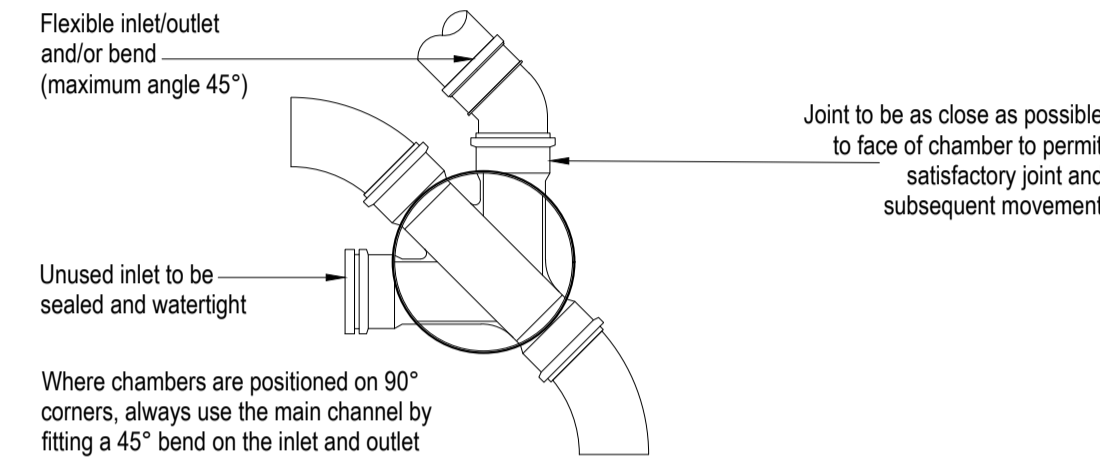
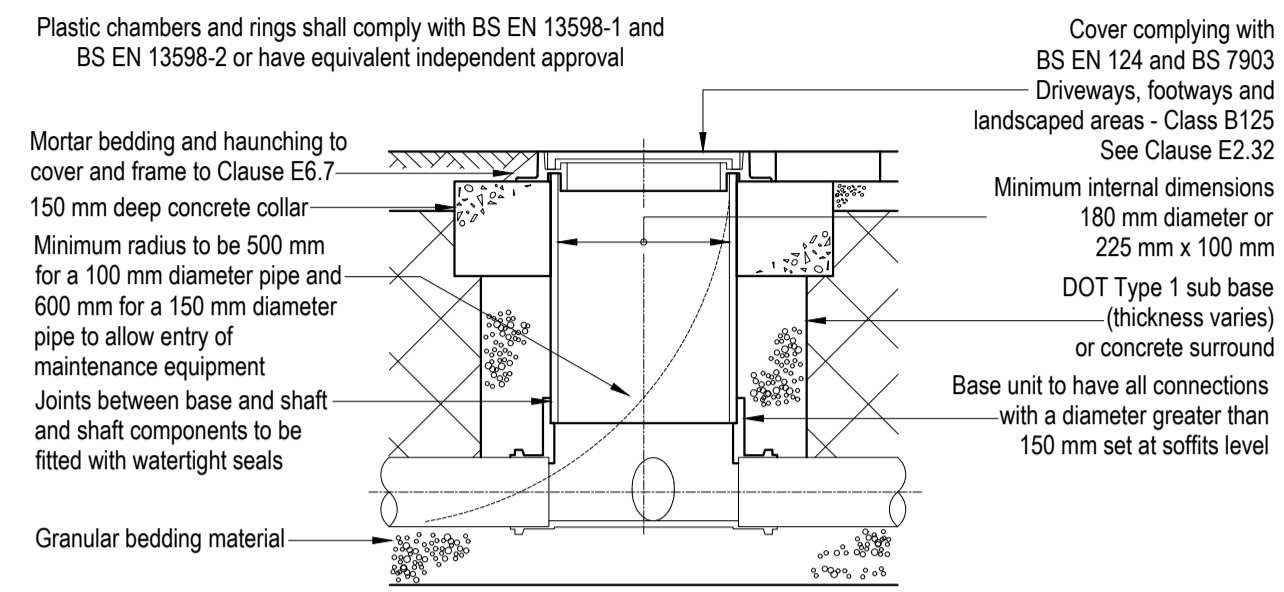
Inspection Chamber - (LV) (suitable for light vehicle loading) Alternate top detail



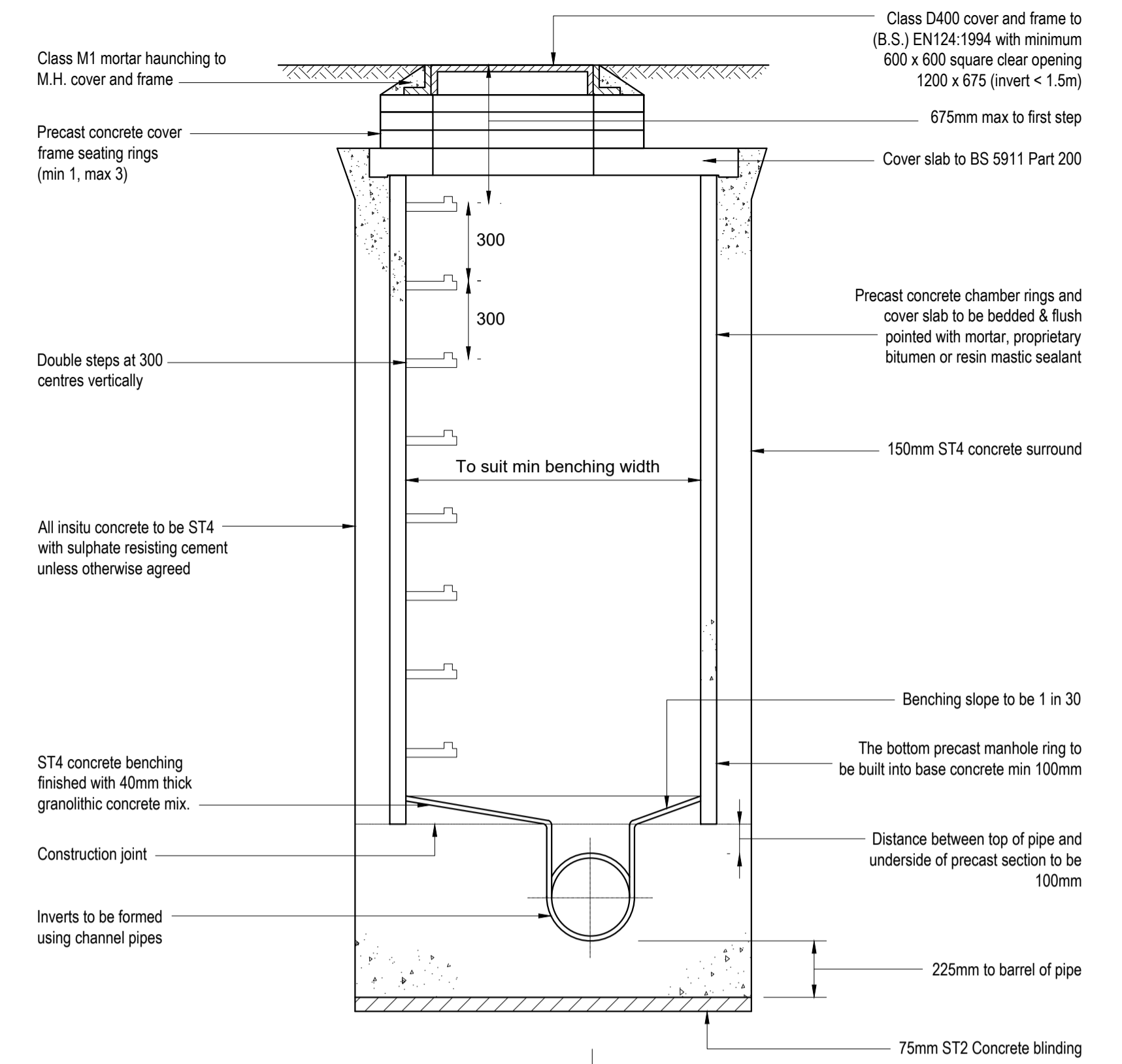
Type 3 - (L) (suitable for landscaping areas with no vehicle loading) Alternate top detail



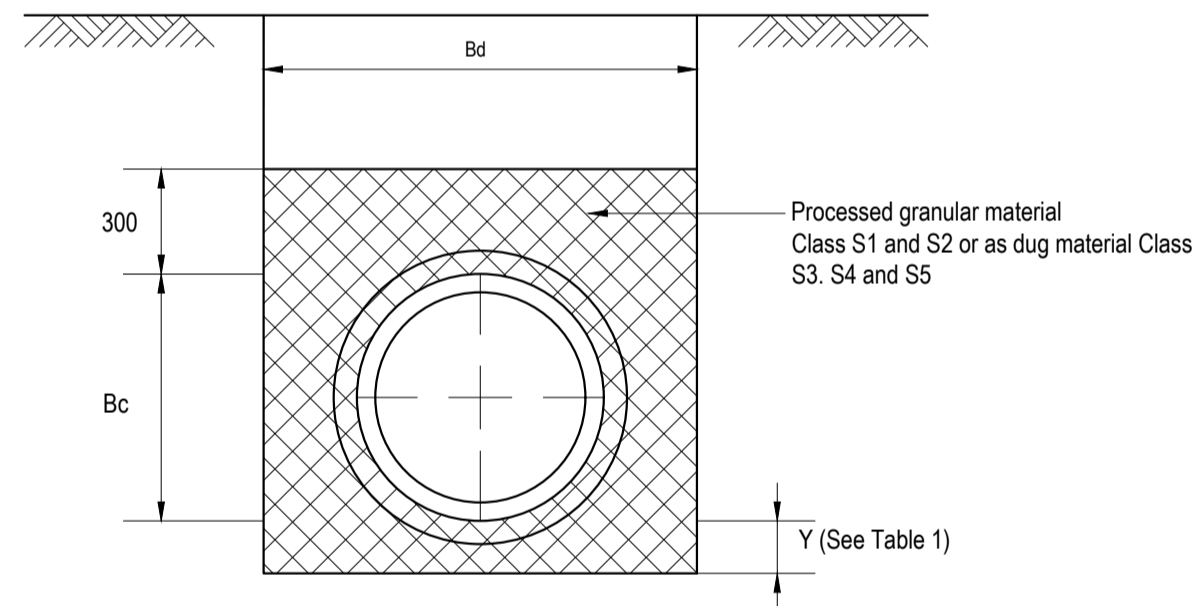
300 Ø Inspection Chamber (suitable for light vehicle loading)



Typical Inspection Chamber Details

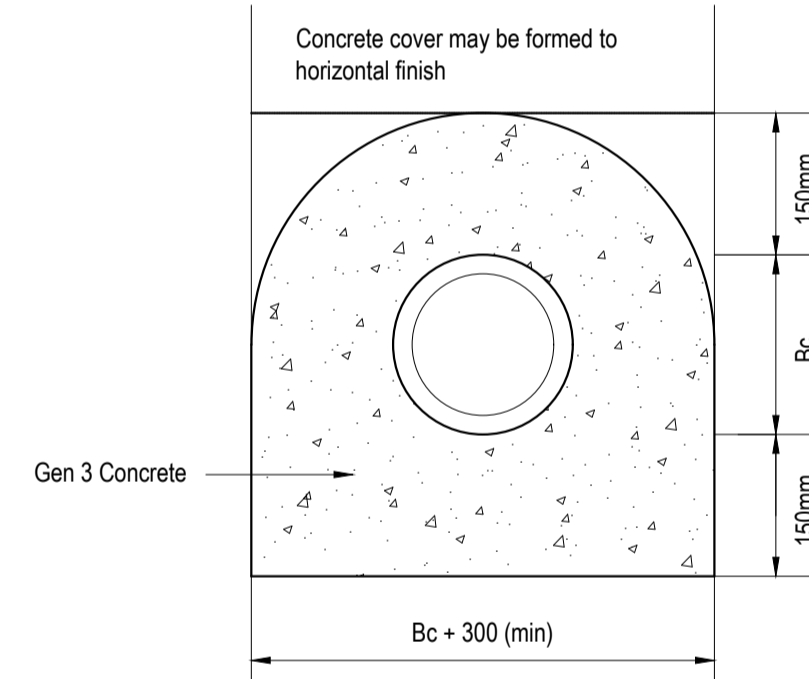


Typical Manhole Detail



Nominal Int Pipe Dia	(Even trench bottom)	Dimension Y2 (Rock or uneven trench bottom)	Minimum Effective Trench Width Bd (see note 2)
<400	100	200	Bc+300
400-700	150	250	Bc+450
725-900	200	300	Bc+600
925-1200	250	350	Bc+800

*Note:
The minimum depth of processed granular material under pipe sockets shall be 50mm for even trench bottom and 150mm for uneven trench bottom.



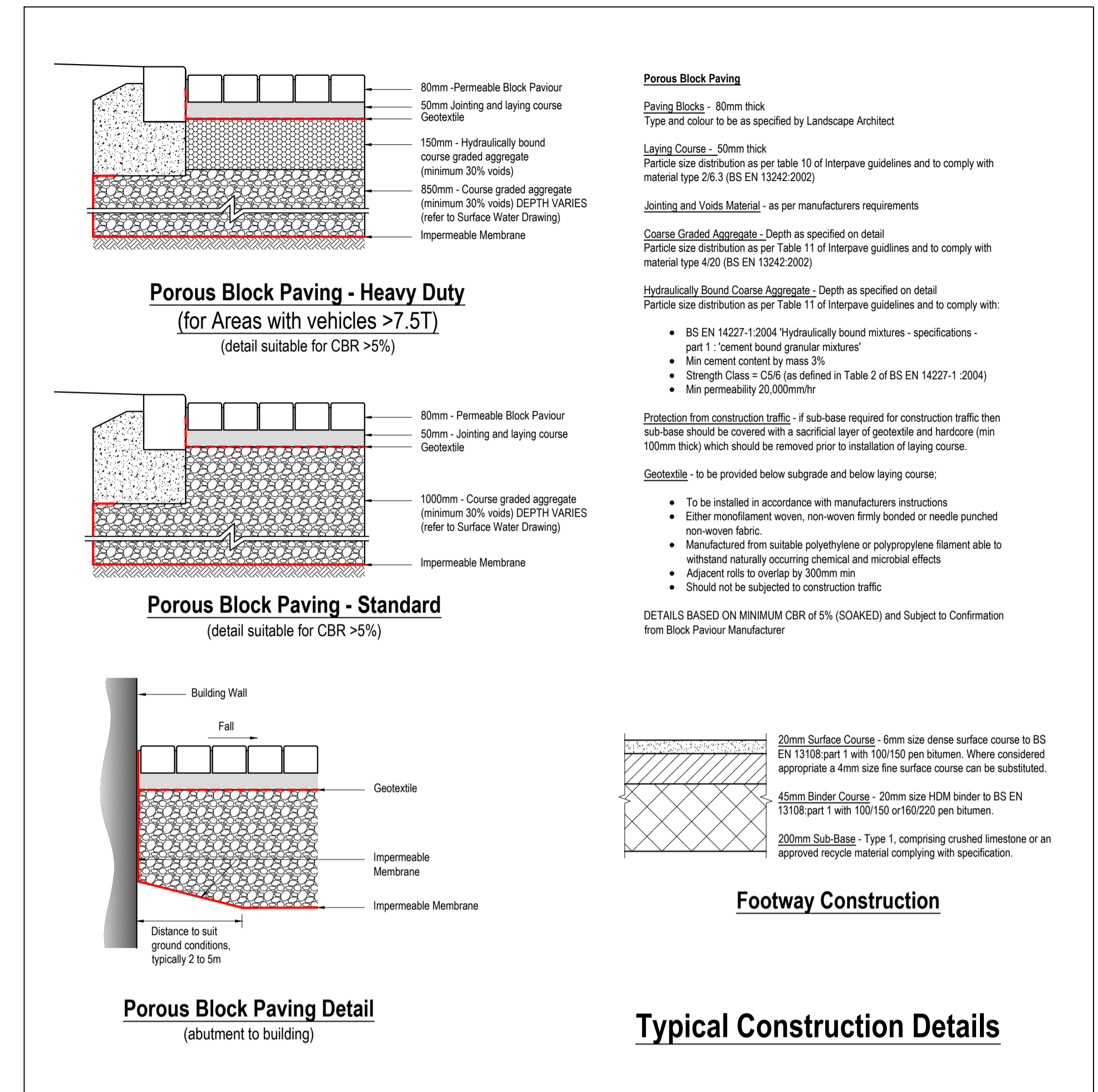
Note:
Bc = outside Ø of pipe

Drainage Pipe Embedment Details

Refer to drawing D2972-D-01 for layout and notes

REV	DATE	AMENDMENT DETAILS	GS	DLW	GS
P1	22/02/22	Preliminary for Comment			
			DRAWN	CHECKED	APPROVED
J Waring & Sons Ltd					
Bristol Avenue - Blackpool		Drwg No.	D2972-D-02	Rev.	P1
Proposed Foul & Surface Water Drainage		Scale	As Shown	Sheet Size	A1
PSA DESIGN		Date	22-02-2022		
PSA Design Ltd The Old Bank House, 6 Berry Lane, Longridge, Preston, PR3 3JA Tel: 01772 786066 www.psadesign.co.uk mail@psadesign.co.uk		Drawn	Checked	Approved	
		GS			

P:\008\Development\02972 - Bristol Avenue - Blackpool\CAD\Drawings\Phase 2 - SW Drainage.dwg



Contractor to provide Engineer with in-situ CBR test results. Until such time all details shown remain provisional

P1	22/02/22	Preliminary for Comment	GS	DLW	GS
REV	DATE	AMENDMENT DETAILS	DRAWN	CHECKED	APPROVED
J Waring & Sons Ltd					
Bristol Avenue - Blackpool			Drwg No.	Rev.	
Surfacing Drawing			D2972-D-03	P1	
			Scale	Sheet Size	
			As Shown	A1	
PSA DESIGN			Date	22-02-2022	
			Drawn	Checked	Approved
			GS		
PSA Design Ltd The Old Bank House, 6 Berry Lane, Longridge, Preston, PR3 3JA Tel. 01772 786066 www.psadesign.co.uk mail@psadesign.co.uk					

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