

**Starwood House
Avenue One
Letchworth Garden City**

**Surface Water Drainage
Statement in Support of the
Discharge of Pre-commencement
Conditions 14 & 23**

For

Letchworth Investment LLP

Ref: 40365-BGL-XX-XX-RP-D-00005

Version V1

Date 13.01.2026

DOCUMENT CONTROL SHEET

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Client: Letchworth Investment LLP

Project: Starwood House, Avenue One, Letchworth Garden City

Title: Surface Water Drainage Statement in Support of the Discharge of Pre-commencement Conditions 14 & 23

Status: For Planning

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1.0 INTRODUCTION

This report has been prepared by Burrows Graham Ltd. On behalf of Letchworth Investment LLP to support the pre-commencement discharge of Conditions 14 & 23 which are relevant to the drainage strategy included in the Planning Decision Notice (ref. 25/01196/FP).

2.0 DECISION NOTICE

The Decision Notice includes two pre-commencement conditions relevant to the drainage and states the following:-

14. *Development, save for demolition and site clearance to slab level, shall not begin until a scheme for surface water disposal has been submitted to and approved in writing by the Local Planning Authority. No drainage systems for the infiltration of surface water drainage into the ground is permitted other than with the express written consent of the Local Planning Authority, which may be given for those parts of the site where it has been demonstrated that there is no resultant unacceptable risk to controlled waters. The development shall be carried out in accordance with the approved details.*

Reason: To ensure that the development does not contribute to, and is not put at unacceptable risk from or adversely affected by, unacceptable levels of water pollution caused by mobilised contaminants. This is in line with paragraph 187 of the National Planning Policy Framework and relevant position statements within the Environment Agency's Approach to Groundwater Protection.

23. *Prior to the commencement of development, save for demolition and site clearance to slab level, construction drawings of the surface water drainage network, associated sustainable drainage components and flow control mechanisms and a construction method statement shall be submitted and agreed in writing by the local planning authority. The scheme shall then be constructed as per the agreed drawings, method statement, FRA & Drainage Strategy (Ref:40365-BGL-XX-XX-RP-D-0001 Rev: 2, dated 25/04/25) and Technical Note (Ref: 40365-BGL-XX-XX-TN-C-0002 Rev: P02, dated 07/08/25) and remain in perpetuity for the lifetime of the development unless agreed in writing by the Local Planning Authority. No alteration to the agreed drainage scheme shall occur without prior written approval from the Local Authority.*

Reason: To ensure that the development achieves a high standard of sustainability and to comply with NPPF Policies of North Herts Council.

3.0 DRAINAGE STRATEGY

The site is located in flood zone 1 and proposed development classed as less vulnerable, and as such the development can be considered appropriate in accordance with NPPF guidelines.

The Drainage Strategy has been prepared in accordance with the approved Flood Risk Assessment REF: 40365-BGL-XX-XX-RP-D-0001, Version 2 and subsequent Technical Note in response to LLFA Comments 40365-BGL-XX-XX-TN-C-0002 P02. The surface water drainage system will offsite discharge rates to the equivalent greenfield rates and is designed to accommodate the 1 in 100 year plus 40% allowance for climate change storm scenario.

Following submission of the FRA, Technical Note and drainage drawing for planning, there have been minor updates to the drainage layout following further coordination. The main change is the roof drainage layout to units 1 and 2 which has resulted in a manhole being removed.

The full set of drainage drawings is included in Appendix A showing the Drainage Layout, Manhole Schedule, and Drainage Construction Details.

The drainage has been remodelled in line with the approved strategy and to suit the minor changes with a full set of calculations in Appendix B. They show no negative impact to the proposed drainage strategy and is in line with the drainage strategy in the approved FRA.

There are also details and manufacturer information of proprietary drainage products such as the flow control devices, attenuation tank and petrol interceptors included in Appendix C. If alternative products are used, they will be to the equivalent standards as those included within this document. Any SuDS components will include impermeable membranes to prevent infiltration into the ground

A Construction Method Statement will be provided by the Contractor.

FLOW PATHS

Above ground SuDS have been included where appropriate. The raingardens/ bio-retention areas will have overflows into the drainage system to further reduce risk of flooding. External levels are designed to fall away from buildings to prevent any exceedance flows entering the building. The Exceedance Flows drawing is in Appendix D which has not changed since planning.

3.0 WATER QUALITY

As part of the drainage design, it's required to provide adequate treatment to the surface water in areas at risk of contamination. Calculations using the simple index approach have been carried out to determine whether adequate treatment has been provided. in accordance with The SuDS Manual, CIRIA C753.

To deliver adequate treatment the SuDS components should have a total pollution mitigation index that equals or exceeds the pollution hazard index.

$$\text{Total SuDS mitigation index} \geq \text{Pollution hazard index}$$

The pollution hazard index is taken from table 26.2 of the SuDS Manual.

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Figure 1 - Pollution hazard indices for different land use classification (Table 26.2 The SuDS Manual CIRIA 753)

Commercial yards and non-residential parking areas are considered as having a medium pollution hazard level. As such, the surface water drainage system must provide sufficient treatment to equal or exceed the corresponding hazard indices.

The indicative mitigation indices for different SuDS components are taken from table 26.3 of The SuDS Manual.

Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 2 - Indicative SuDS mitigation indices (Table 26.3 The SuDS Manual CIRIA 753)

Where the mitigation index of an individual component is insufficient, two components (or more) in series will be required and calculated as below.

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5(\text{mitigation index}_2) + \dots$$

The surface water drainage system utilises various SuDS components and summarised below.

SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Full Retention Separator	0.8	0.6	0.9
Permeable Paving	0.7	0.6	0.7
Rain Garden	0.8	0.8	0.8

Surface water run-off from the access road will be treated by the bioretention areas, runoff from the yard will pass through full retention separators and car park runoff will be intercepted and treated by lined permeable paving. Based on a medium pollution hazard level of medium, each of the proposed SuDS treatment components in isolation have an equal or higher mitigation index, so therefore provides adequate surface water treatment.

4.0 CONCLUSION

This note has been produced as part of the submission to discharge pre-commencement conditions 14 & 23. Detailed drainage drawings, calculations and manufacturers information have been included within the appendices with changes to the layout remodelled and show no negative effect to the previously approved drawings. This note is expected to provide sufficient detail to demonstrate the design meets the LLFA requirements and is sufficient to discharge the condition.

APPENDIX A – BGL DRAINAGE DRAWINGS



DRAINAGE NOTES:

- Do not scale from this drawing, work to dimensions or co-ordinates provided. All levels are in metres and all dimensions are in millimetres, unless otherwise noted (u.o.n.). If in doubt seek clarification.
- This drawing is to be read in conjunction with all relevant drawings, specifications and documentation.
- The Contractor MUST check the position, size and levels of all existing drains / sewers / pipes / outfalls / manholes that are being retained prior to the commencement of the site works and any discrepancies reported immediately to Burrows Graham Limited. Contractor should allow for cleaning / jetting / surveying retained drainage.
- The Contractor must check for any offsite connections to the existing site drainage and report any findings to Burrows Graham Limited.
- The Contractor is responsible for obtaining all required permits and licenses (S106 agreements).
- All works are assumed to be within public highway or within land owners lands & no works are required on third party land owners property.
- Any gradients of drains indicated are indicative only and the Contractor shall install the drains to the specified levels shown for each chamber (u.o.n.).
- Cover levels of the access points are provisional and subject to adjustment on site to suit the finished ground levels. All external works construction areas to be as located by the architect.
- Positions and sizes of above ground foul and surface water drainage connections ("pop-ups") are indicative only. Setting out and confirmation of the internal requirements is the responsibility of the architect. Contractor to confirm requirement prior to construction.
- Design assumes that no sewerage authority sewers or other drainage systems require modification, diversion or abandoning (u.o.n.).
- Drainage channels are to be ACO Qmax in service yards and ACO Multidrain in car parks, or similar approved. Channels are to be sized by the supplier and approved by the Engineer in writing prior to ordering. Drainage channels to be installed to manufacturers' requirements. Design of channels shall be based on a 1 in 100 year storm return period, 15 minute duration. Outlet units on channel drains to include silt traps.
- All RWP, gully and channel connections shall be 150mm dia UNO. Wastewater stack connections shall be 100mm dia. UNO and shall have internal above ground rodding eyes or large access fittings in accordance with Building Regulations.
- All WPCs, SRWPs and RWP's are shown indicatively. Locations shall be confirmed by others.
- No deep rooting trees/vegetation should be planted within 5.0m of any drainage works.

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

CONSTRUCTION

MAINTENANCE

DEMOLITION

KEY:

- Existing AW Foul Water Sewer
- Existing AW Surface Water Sewer
- Existing Foul Water Drainage
- Existing Surface Water Drainage
- Existing Drainage to be Abandoned
- Surface Water Drainage Pipe
- Surface Water Drainage Manhole
- Surface Water Drainage Channel
- Filter Drainage Pipe
- Offset Kerb Drainage
- Foul Water Drainage Pipe
- Foul Water Drainage Manhole
- Above Ground Syphonic Pipework
- Proposed Permeable Surfacing
- Proposed Green SuDS (Tree Pits/Rain Garden & Green Roofs)
- DU
- Diffuser Unit at Base of Permeable Surfacing
- Road Gully
- Planning Boundary

T03	13.01.26	GL	SWMH03 removed, Syphonic split between units 1 and 2	RM
T02	07.08.25	GL	Drainage updated to suit QBar discharge	RM
T01	10.07.25	GL	Issued for Tender	RM
P03	24.06.25	FT/GL	Drainage updated following coordination	RM
P02	25.04.25	PG	Unit 1 Car Park Updated	RM
P01	17.04.25	PG	Issued for information	RM
REV	DATE	BY	DESCRIPTION	CHKD

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CLIENT
Wrenbridge

PROJECT
Letchworth, Ave One

DRAWING TITLE
DRAINAGE STRATEGY PLAN

BGL PROJECT NUMBER	DRAWING STATUS	OFFICE	SOUTH
40365	TENDER	DRAWN BY	PG
SCALE @ A0	DATE	CHECKED BY	RM
1:250	16.04.2025		
DRAWING No		REV	
40365-BGL-XX-XX-DR-C-00210		T03	

MANHOLE SCHEDULE - Proposed SW														
Structure Name	Manhole Type	Cover Level	Inlet Pipe Size (mmØ)	Invert Level of Inlet Pipes	Outlet Pipe Size (mmØ)	Invert Level of Outlet	Sump Depth	Approximate Depth to Sump	Internal Size	Class	Cover Type Clear Opening	Easting	Northing	Remarks
SWMH01	PC Ring	80.924	225 450	79.150 79.500	450	78.850	0.600	2.674	1500Ø	D400	600x600	523336.161	232921.532	-
SWMH02	PC Ring	81.014	450	78.690	450	78.690	0.000	2.324	1500Ø	D400	600x600	523314.845	232913.231	-
SWMH04	PC Ring	81.634			450	79.520	0.000	2.114	1500Ø	D400	600x600	523281.298	232886.804	-
SWMH05	PC Ring	81.394	450 450	78.640 78.800	600	78.560	0.600	3.434	1800Ø	D400	600x600	523298.309	232906.980	-
SWMH06	PC Ring	81.306	150 300	79.480 79.800	375	79.250	0.600	2.656	1200Ø	D400	600x600	523278.222	232938.127	-
SWMH07	PC Ring	81.305	375	79.080	450	79.080	0.000	2.225	1200Ø	D400	600x600	523271.634	232955.320	-
SWMH08	PC Ring	81.395	600 450	78.430 78.750	600	78.430	0.600	3.565	1500Ø	D400	600x600	523275.381	232967.632	-
SWMH09	PC Ring	81.733			450	79.500	0.600	2.833	1350Ø	D400	600x600	523246.967	232958.353	Vented Cover
SWMH10	PC Ring	81.290	375	78.750	375	78.750	0.000	2.540	1350Ø	D400	600x600	523258.513	232980.538	-
SWMH11	PC Ring	81.450			450	79.500	0.000	1.950	1350Ø	D400	600x600	523275.977	232986.056	Vented Cover
SWMH12	PC Ring	81.374	600 375 450	78.390 78.710 78.630	600	78.390	0.600	3.584	1800Ø	D400	600x600	523269.027	232984.439	-
SWMH13	PC Ring	80.993			450	79.300	0.000	1.693	1350Ø	D400	600x600	523194.779	232980.549	-
SWMH14	PC Ring	81.268	450	79.190	450	79.190	0.000	2.078	1350Ø	D400	600x600	523229.191	232989.455	-
SWMH15	PC Ring	81.265	600 450	78.360 78.600	600	78.360	0.600	3.505	1800Ø	D400	600x600	523263.741	232998.422	-
SWMH15A	PPIC	81.457			150	80.700	0.000	0.757	450Ø	C250	450x450	523282.084	233002.968	Recessed Cover
SWMH16	PPIC	80.721			375	79.600	0.000	1.121	450Ø	D400	300x300	523331.622	233035.494	Recessed Cover
SWMH17	PC Ring	80.695	375 600	78.200 78.210	600	78.210	0.600	3.095	1800Ø	D400	600x600	523336.914	233029.693	-
SWMH18	PC Ring	81.194			450	79.540	0.000	1.654	1350Ø	C250	600x600	523349.640	233010.248	Vented Cover
SWMH19	PC Ring	80.755	600 450	78.160 78.430	375	78.160	0.600	3.195	1800Ø	C250	600x600	523343.931	233028.990	Flow Control

MANHOLE SCHEDULE - PROPOSED FW													
Structure Name	Manhole Type	Cover Level	Inlet Pipe Size (mmØ)	Invert Level of Inlet Pipes	Outlet Pipe Size (mmØ)	Invert Level of Outlet	Approximate Depth to Sump	Internal Size	Class	Cover Type Clear Opening	Easting	Northing	Remarks
FWMH01	PPIC	81.800	100	81.100	100	81.100	0.700	450Ø	C250	450x450	523261.203	232872.702	-
FWMH02	PPIC	81.806	100	80.740	100	80.740	1.066	450Ø	C250	300x300	523274.768	232877.499	Recessed Cover
FWMH03	PC Ring	81.670	100 100 100	80.380 80.380 80.380	100	80.380	1.290	1200Ø	D400	600x600	523273.317	232885.386	-
FWMH04	PC Ring	81.420	100	79.880	100	79.880	1.540	1200Ø	D400	600x600	523300.168	232897.521	-
FWMH05	PC Ring	81.425	100	78.960	100	78.960	2.465	1200Ø	D400	600x600	523280.538	232948.981	-
FWMH06	PPIC	81.789	100	81.030	100	81.030	0.759	450Ø	C250	450x450	523193.432	232962.478	-
FWMH07	PPIC	81.791	100 100	80.220 80.210	100	80.210	1.581	1200Ø	C250	600x600	523222.831	232974.000	Recessed Cover
FWMH08	PC Ring	81.760	100	79.910	100	80.500	1.850	1200Ø	D400	600x600	523249.164	232949.926	-
FWMH09	PC Ring	81.696	100 100 100 100	79.910 80.355 80.352 80.348	100	79.910	1.785	1200Ø	D400	600x600	523240.530	232972.477	-
FWMH10	PC Ring	81.732	100 100	79.660 79.660	100	79.660	2.072	1200Ø	D400	600x600	523238.024	232979.583	Recessed Cover
FWMH11	PC Ring	81.234	100 100	78.220 78.720	100	78.220	3.014	1200Ø	D400	600x600	523264.698	232990.301	-
FWMH12	PC Ring	81.317	100 100	80.020 80.020	100	80.020	1.297	1200Ø	D400	600x600	523271.333	232990.081	-
FWMH13	PC Ring	81.317	100 100	78.100 78.100	100	78.100	3.217	1200Ø	D400	600x600	523268.007	232998.682	-
FWMH13a	PC Ring	81.313	100 100	77.835 80.008	100	77.835	3.478	1200Ø	D400	600x600	523287.283	233006.580	-
FWMH14	PC Ring	81.425	100	80.200	100	80.200	1.225	1200Ø	D400	600x600	523367.662	232959.464	-
FWMH15	PC Ring	81.236	100 100	78.690 78.690	100	78.610	2.626	1200Ø	C250	600x600	523344.398	233016.831	-
FWMH16	PC Ring	80.789	100 100	77.110 78.400	100	77.110	3.679	1200Ø	D400	600x600	523339.700	233028.057	-

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CONSTRUCTION			
MAINTENANCE			
DEMOLITION			
IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT			

- DRAINAGE NOTES:
1. This drawing is to be read in conjunction with all relevant drawings, specifications and documentation.
 2. Refer to drawing 40365-BGL-XX-XX-DR-C-00210 for the Drainage Layout.

T03	13.01.26	GL	SWMH03 removed	RM
T02	07.08.25	GL	Updated to suit revised drainage	RM
T01	10.07.25	GL	Issued for Tender	RM
P01	24.06.25	GL	Preliminary Issue	RM
REV	DATE	BY	DESCRIPTION	CHKD

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CLIENT

WRENBRIDGE

PROJECT

AVENUE ONE
LETCHWORTH

DRAWING TITLE

MANHOLE SCHEDULE

BGL PROJECT NUMBER
40365

DRAWING STATUS
TENDER

OFFICE
SOUTH

SCALE @ A1
NTS

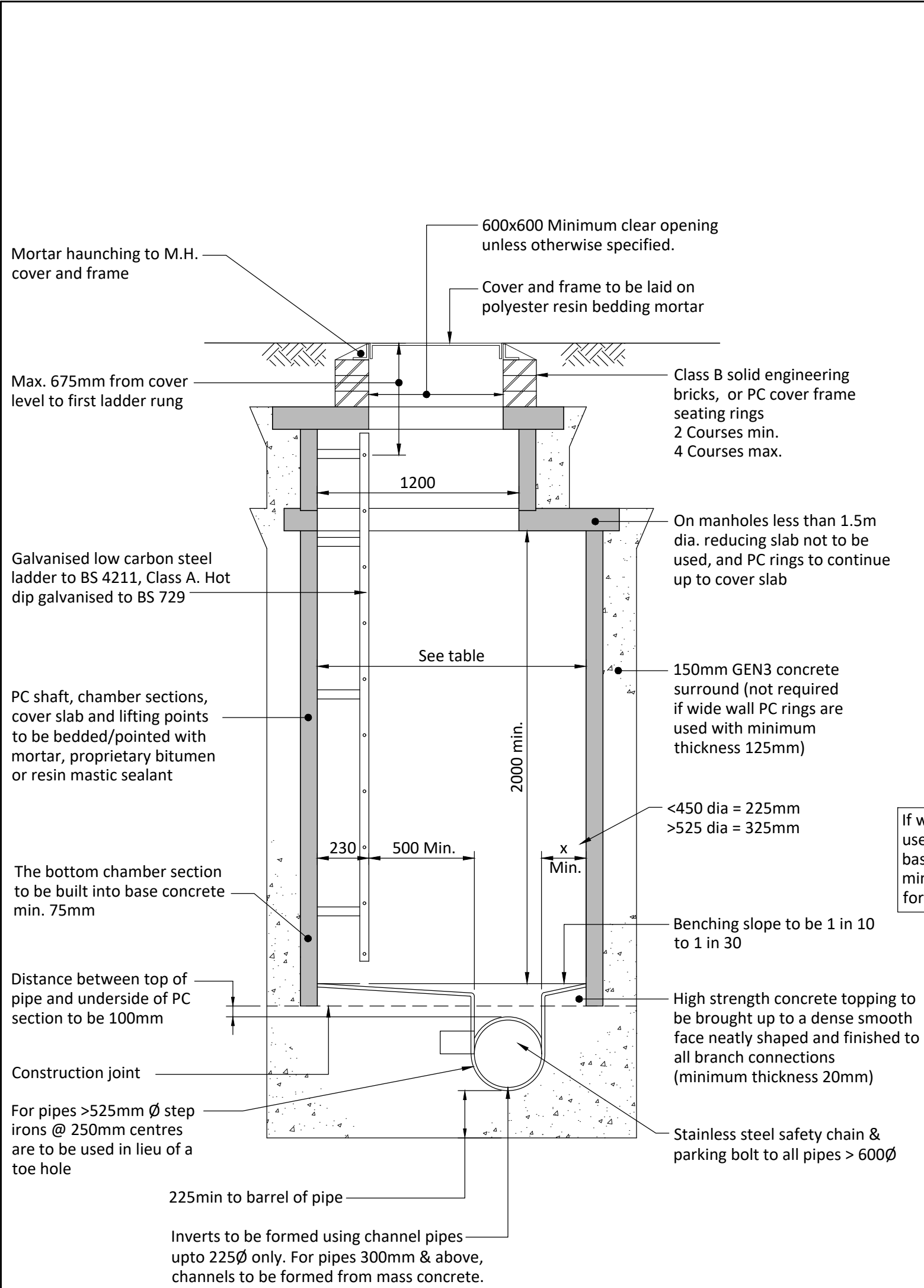
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24/06/2025

DRAWN BY
GL

CHECKED BY
RM

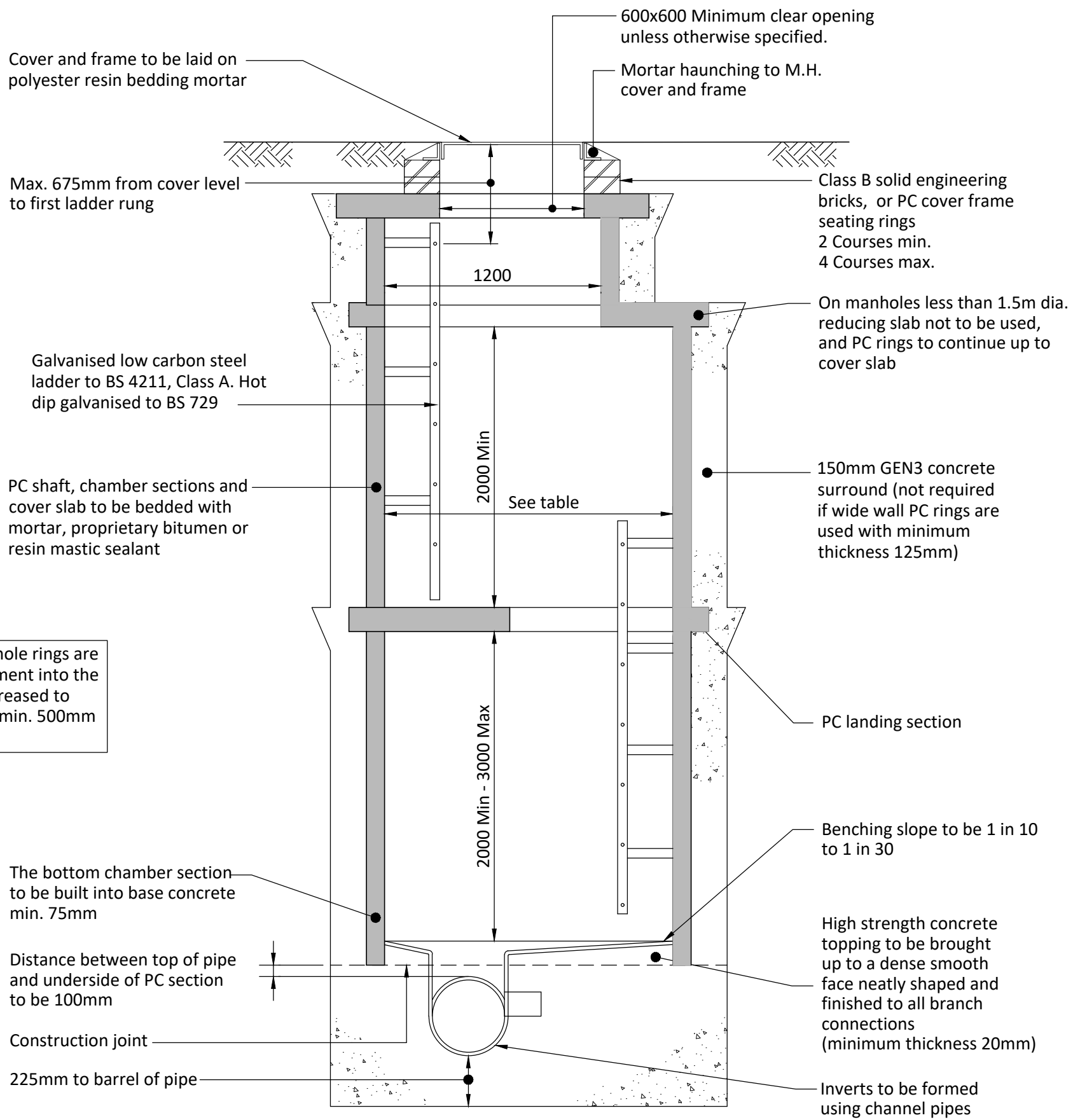
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REV
T03



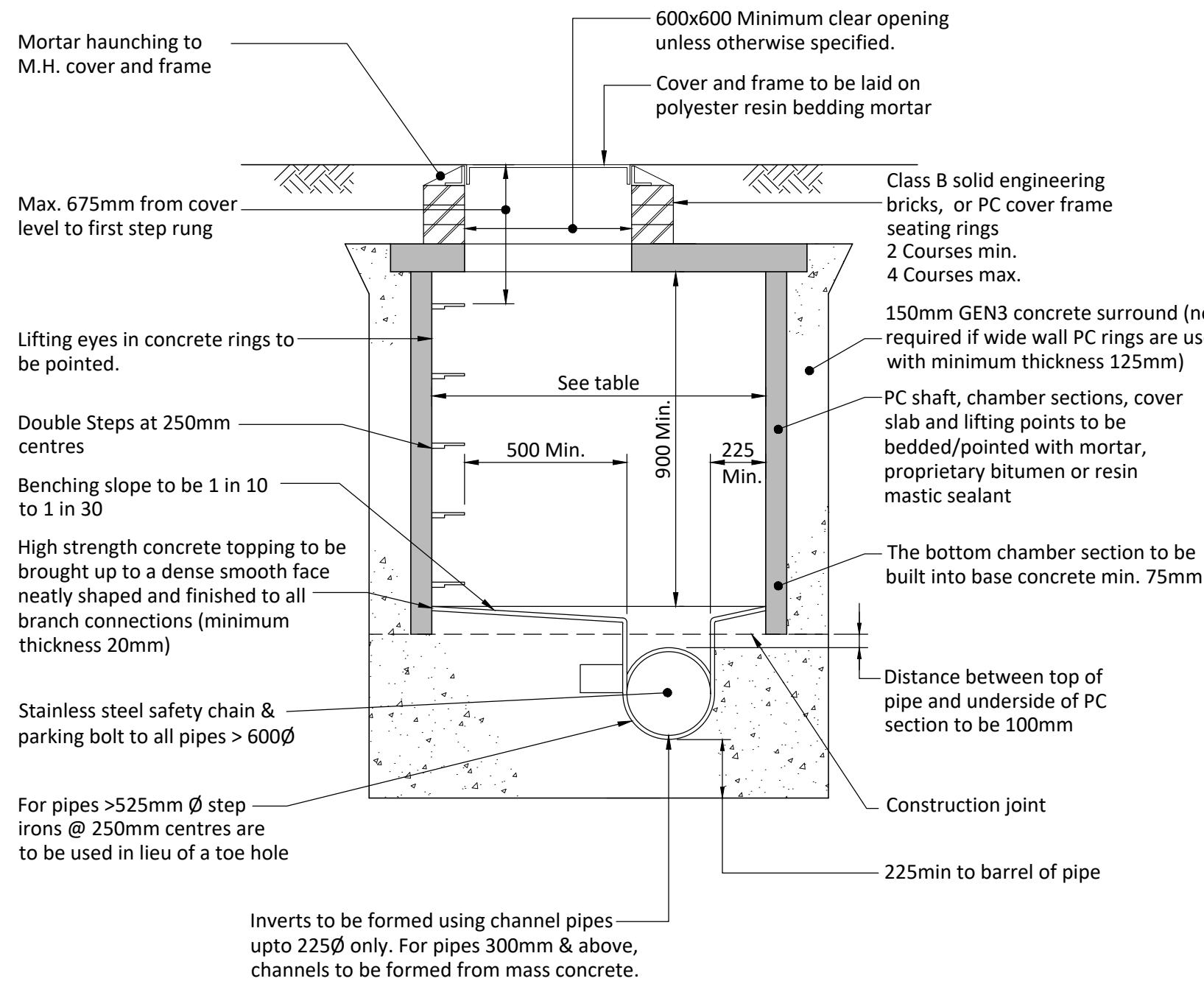
TYPICAL MANHOLE DETAIL TYPE 1A

DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 3m TO 6m



TYPICAL MANHOLE DETAIL TYPE 1B

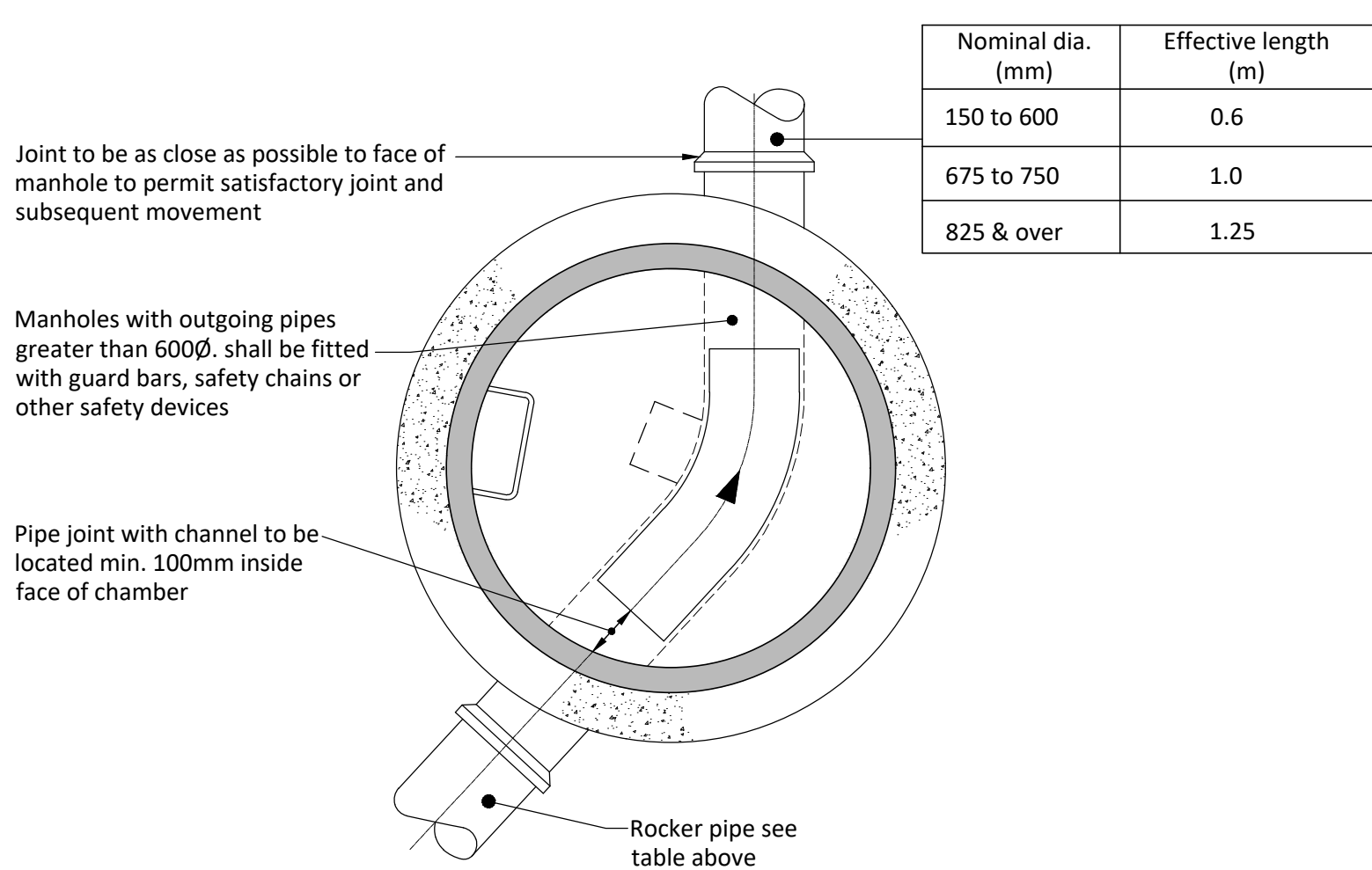
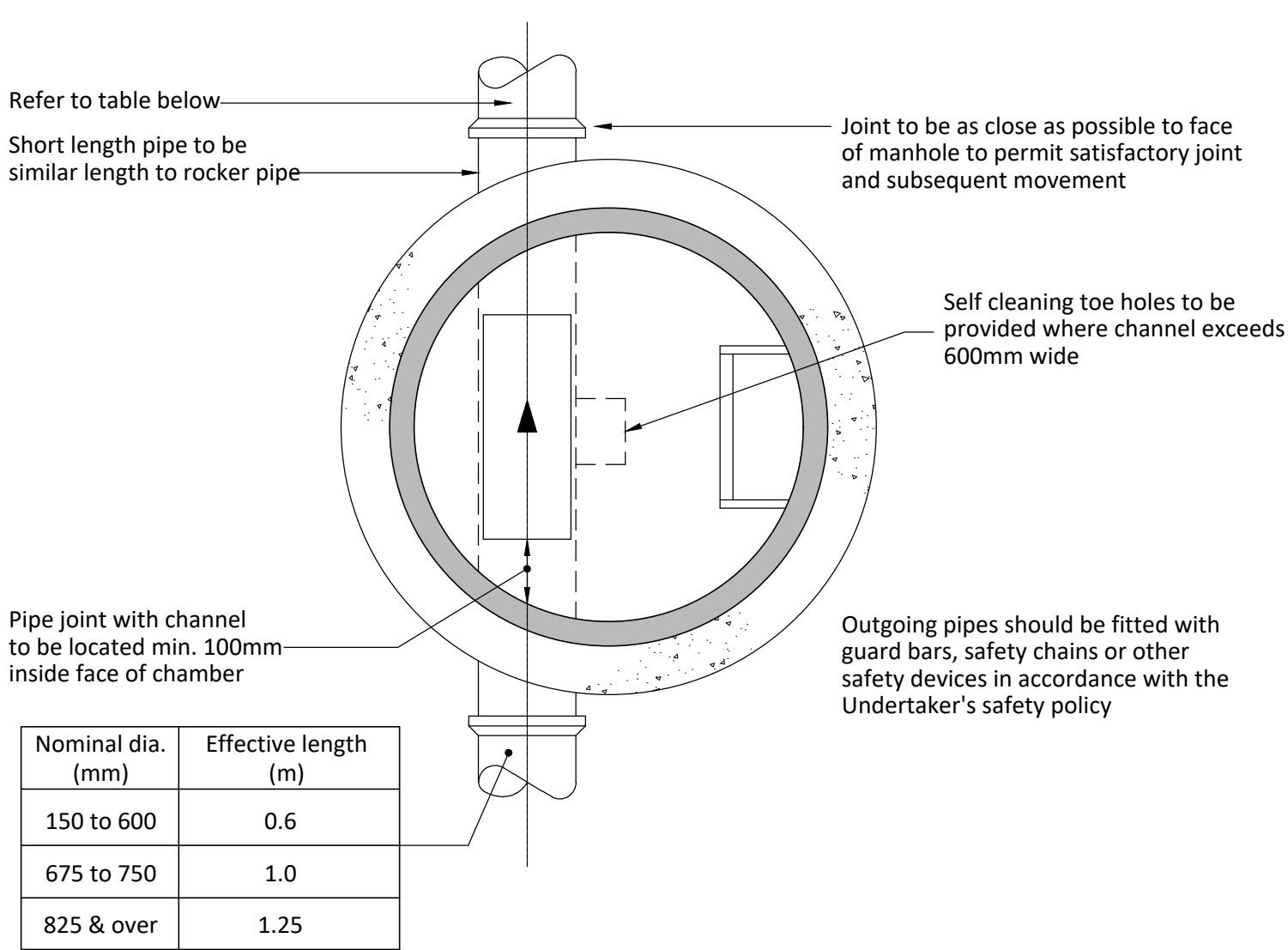
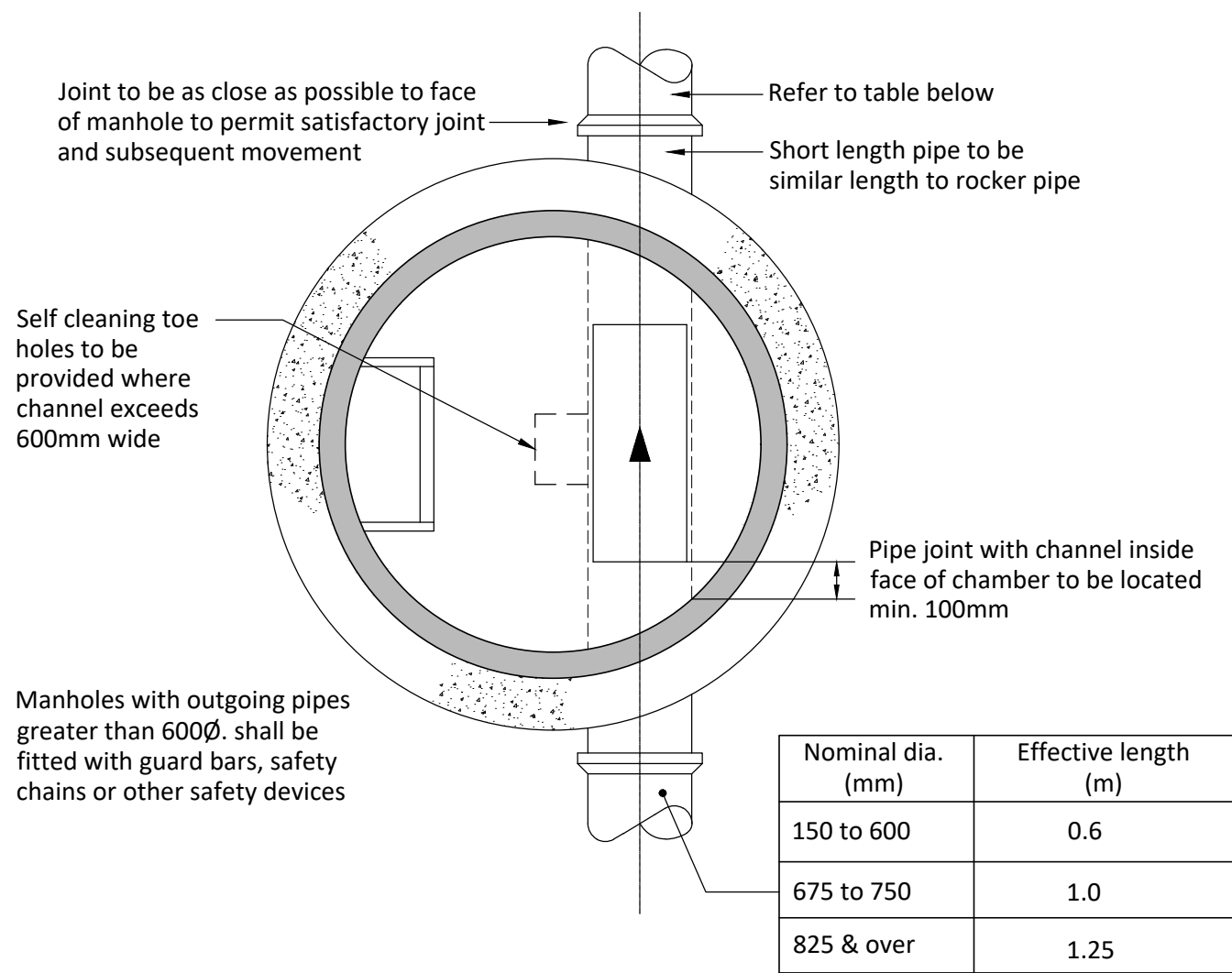
DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 6m MINIMUM



TYPICAL MANHOLE DETAIL TYPE 2

DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 1.5m* TO 3.0m

NOTE: P.C.C CHAMBER RINGS USED FOR MANHOLES LESS THAN 1500 TO SOFFIT WITHIN HIGHWAYS FOR LOAD CLASS D400 SHALL BE 600X600 CLEAR OPENING. ALL MAINTENANCE SHALL BE CARRIED OUT FROM THE SURFACE. NO STEP RUNGS SHALL BE PROVIDED. THE COVER OPENING SHALL BE LOCATED OVER THE OUTGOING PIPE.



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CONSTRUCTION

MAINTENANCE

DEMOLITION

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT

- General Notes:
- This drawing shall be read in conjunction with all the relevant Architects, Engineers' and Service Engineers drawings & specifications.
 - For all buried concrete design sulphate and ASEC classes of DS-1 and AC-1s for Made Ground, Reworked Natural, Holywell Nodular Chalk and New Pit Chalk Formation up to a maximum depth of 18m. Refer to TRC Intrusive Geoenvironmental and Geotechnical Site Assessment dated May 2025.

T01	26.06.25	GL	Issued for Tender	RM
REV	DATE	BY	REVISION	CHKD

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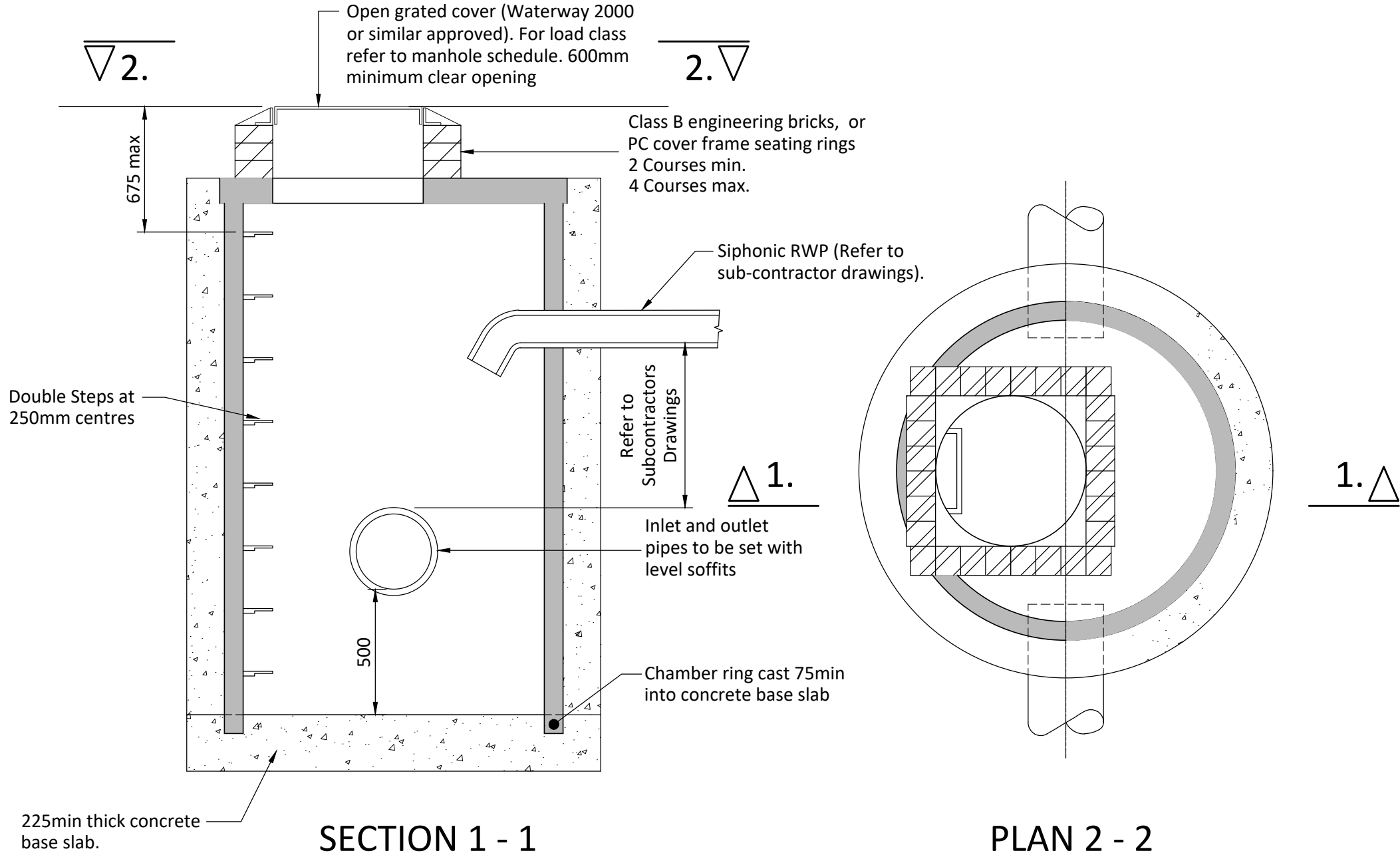
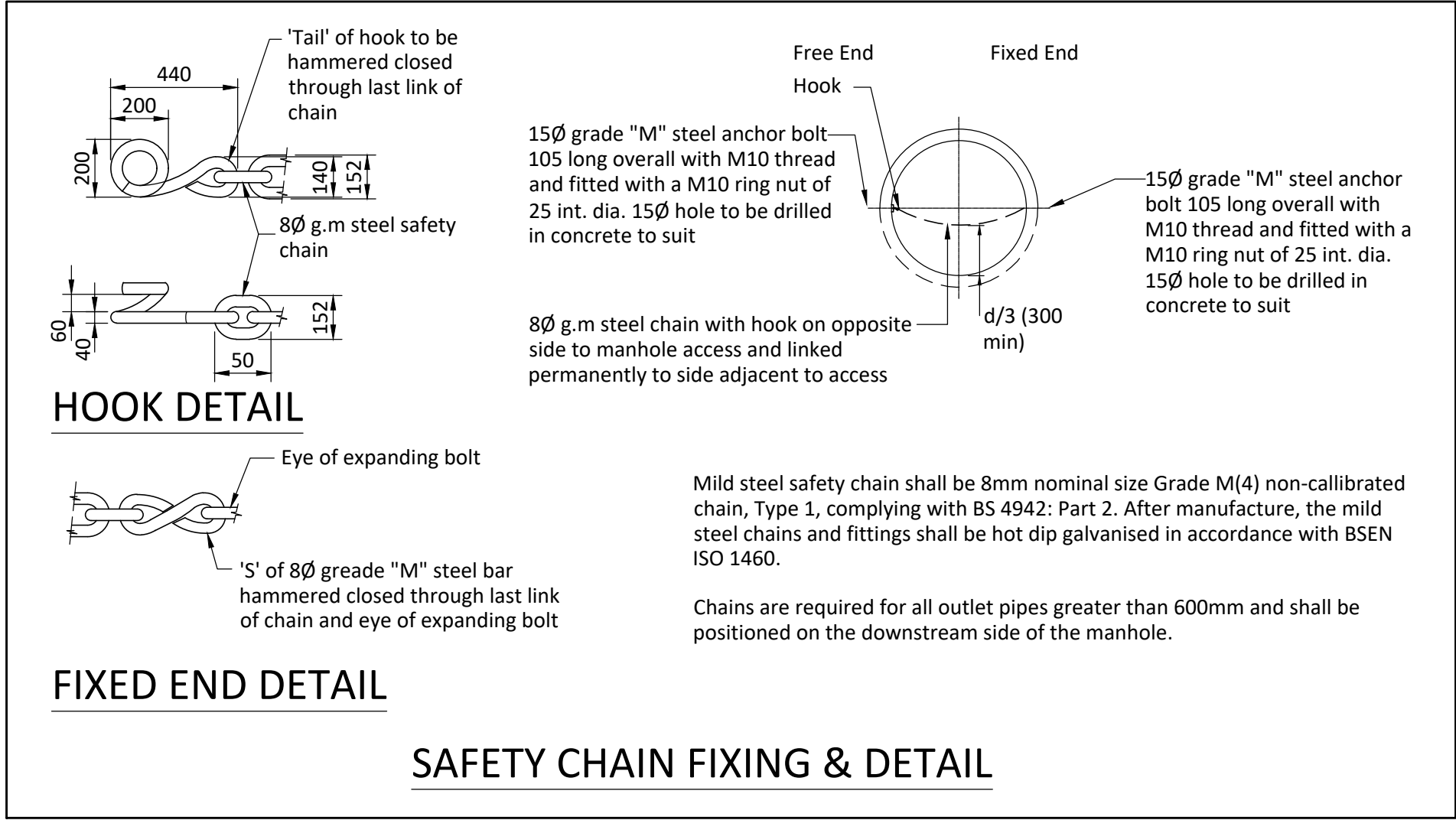
CLIENT
WRENBRIDGE

PROJECT
**AVENUE ONE
LETCWORTH**

DRAINAGE AND EXTERNAL DETAILS SHEET 1

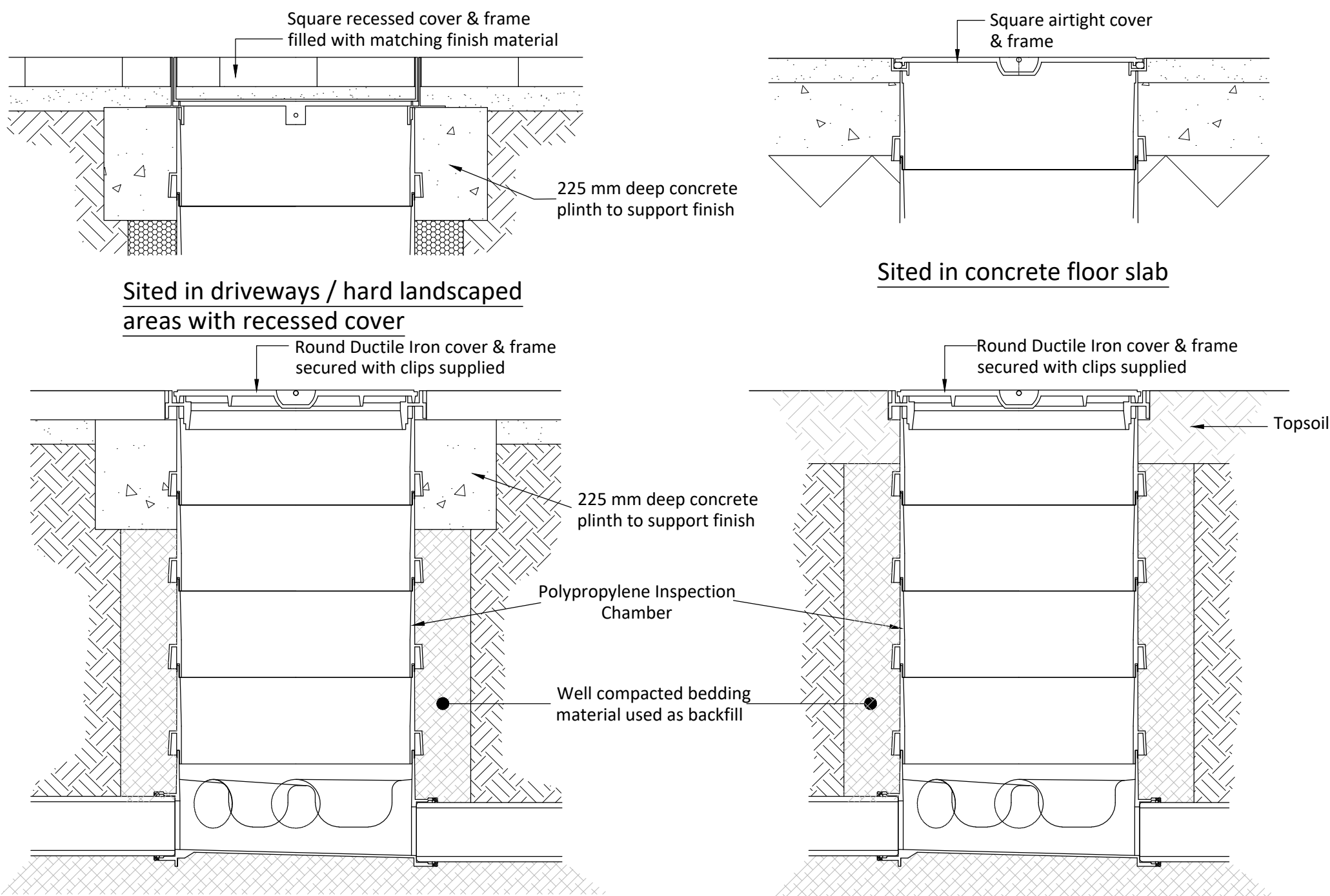
OUR PROJECT NUMBER 40365	DRAWING STATUS TENDER	OFFICE SOUTH
SCALE @ A1 1:100	DATE 26.06.2025	DRAWN BY GL CHECKED BY RM

DRAWING No 40365-BGL-XX-XX-DR-C-00221	REV T01
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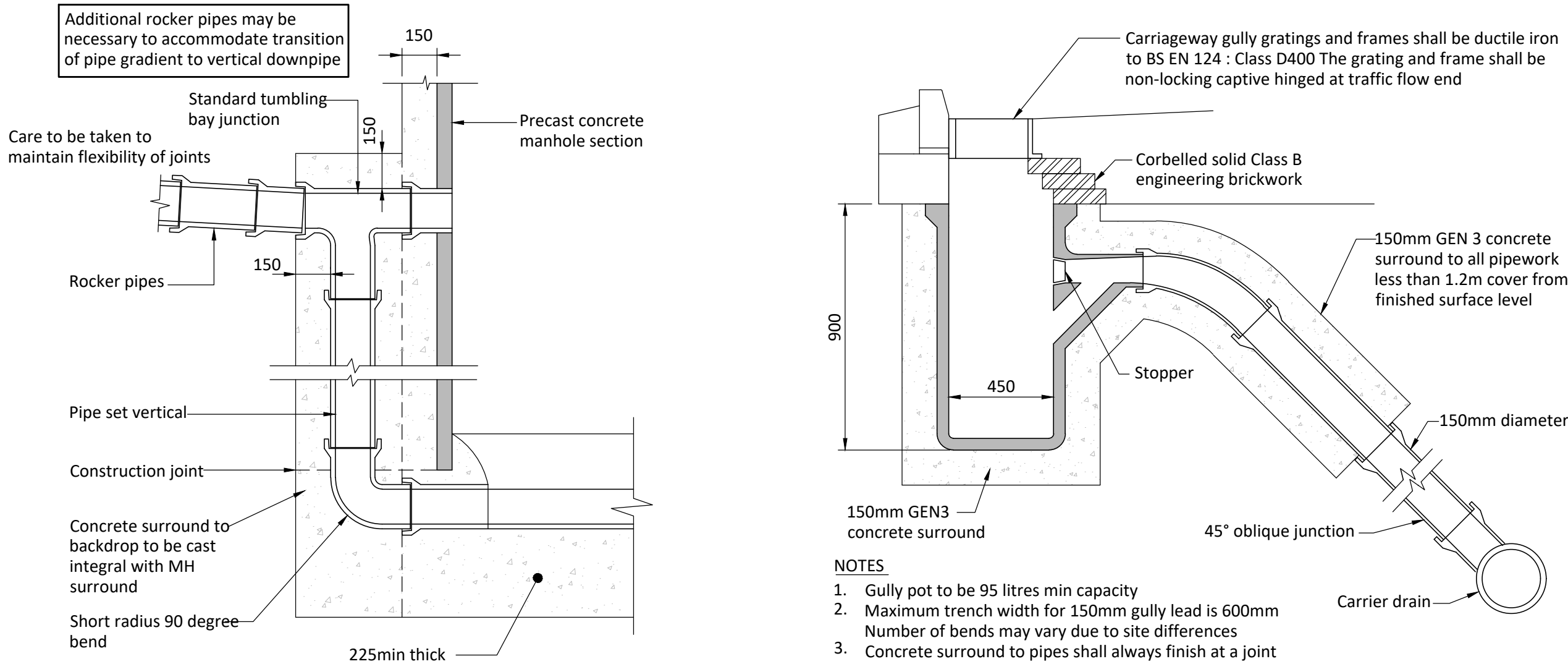
CATCHPIT MANHOLE - TO RECEIVE SIPHONIC CONNECTIONS

CHAMBER CONSTRUCTION AS FOR PCC MANHOLES

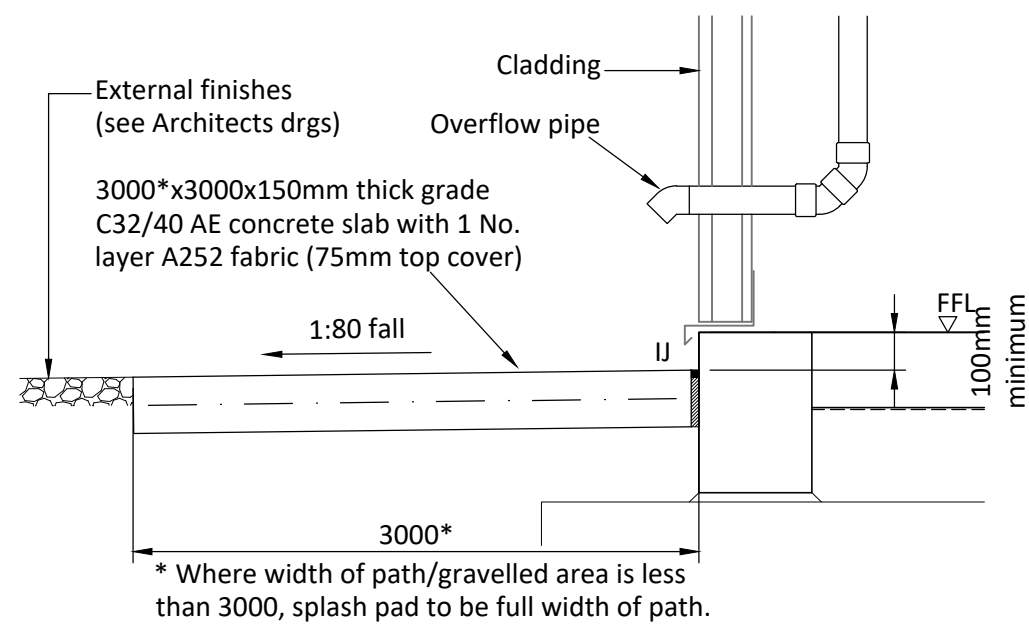


POLYPROPYLENE INSPECTION CHAMBER DETAIL TYPE 4

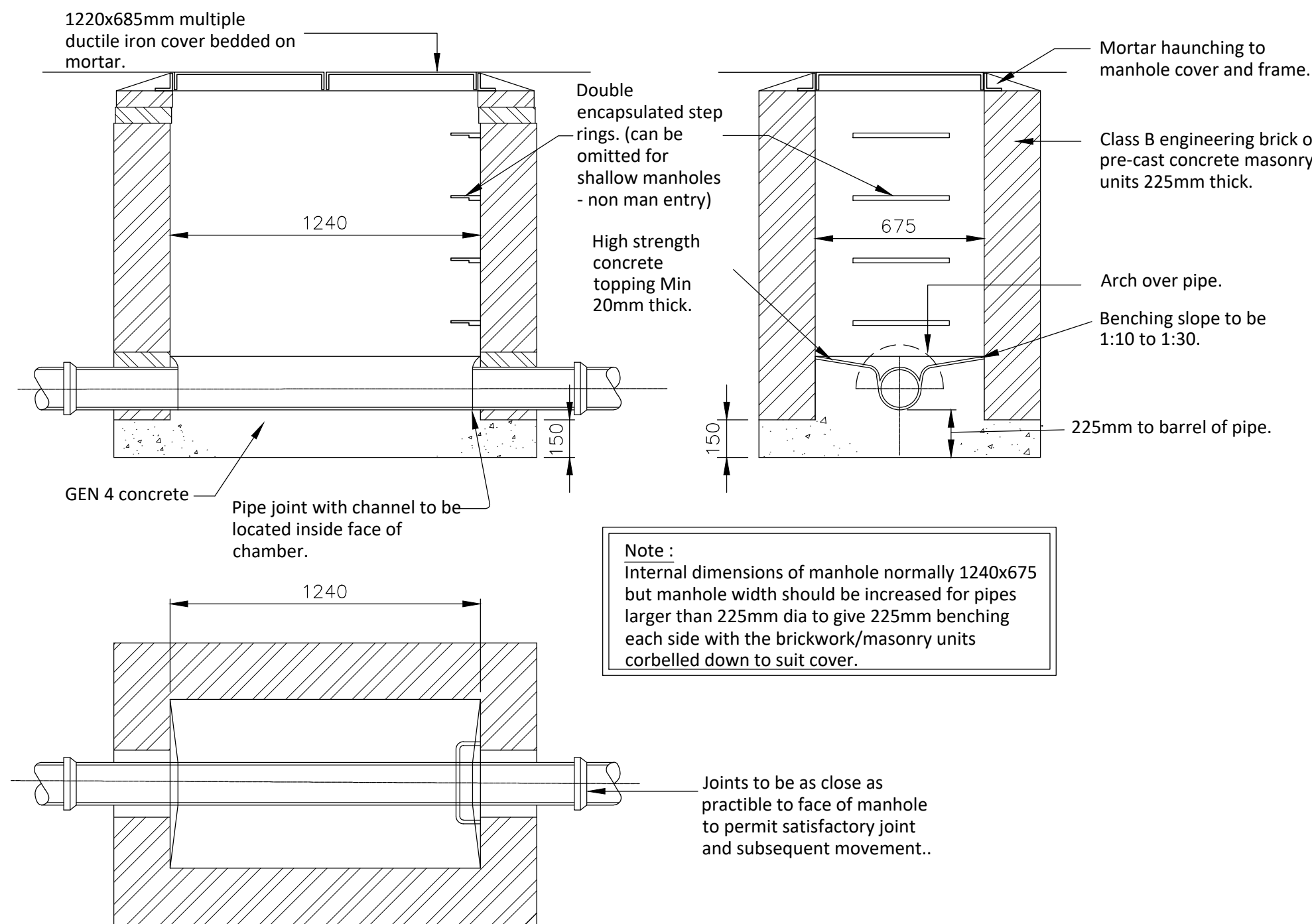
DEPTH FROM COVER LEVEL TO INVERT LEVEL < 1.2m
NB - Universal Product - Adaptor to pvc-u pipe included



GULLY DETAIL WITH CONNECTION TO CARRIER DRAIN



SIPHONIC SPLASH PAD DETAIL



TYPICAL MANHOLE DETAIL TYPE 4

DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE UP TO 1m

Rocker pipe length	
Nominal dia. (mm)	Effective length (m)
150 to 600	0.6
675 to 750	1.0
825 & over	1.25

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION			
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING			
CONSTRUCTION			
MAINTENANCE			
DEMOLITION			
IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT			
General Notes:			
1. This drawing shall be read in conjunction with all the relevant Architects, Engineers' and Service Engineers drawings & specifications.			
2. For all buried concrete design sulphate and ACEC classes of DS-1 and AC-1s for Made Ground, Reworked Natural, Holywell Nodular Chalk and New Pit Chalk Formation up to a maximum depth of 18m. Refer to TRC Intrusive Geoenvironmental and Geotechnical Site Assessment dated May 2025.			

T01	26.06.2025	GL	Issued for Tender	RM
REV	DATE	BY	REVISION	CHKD

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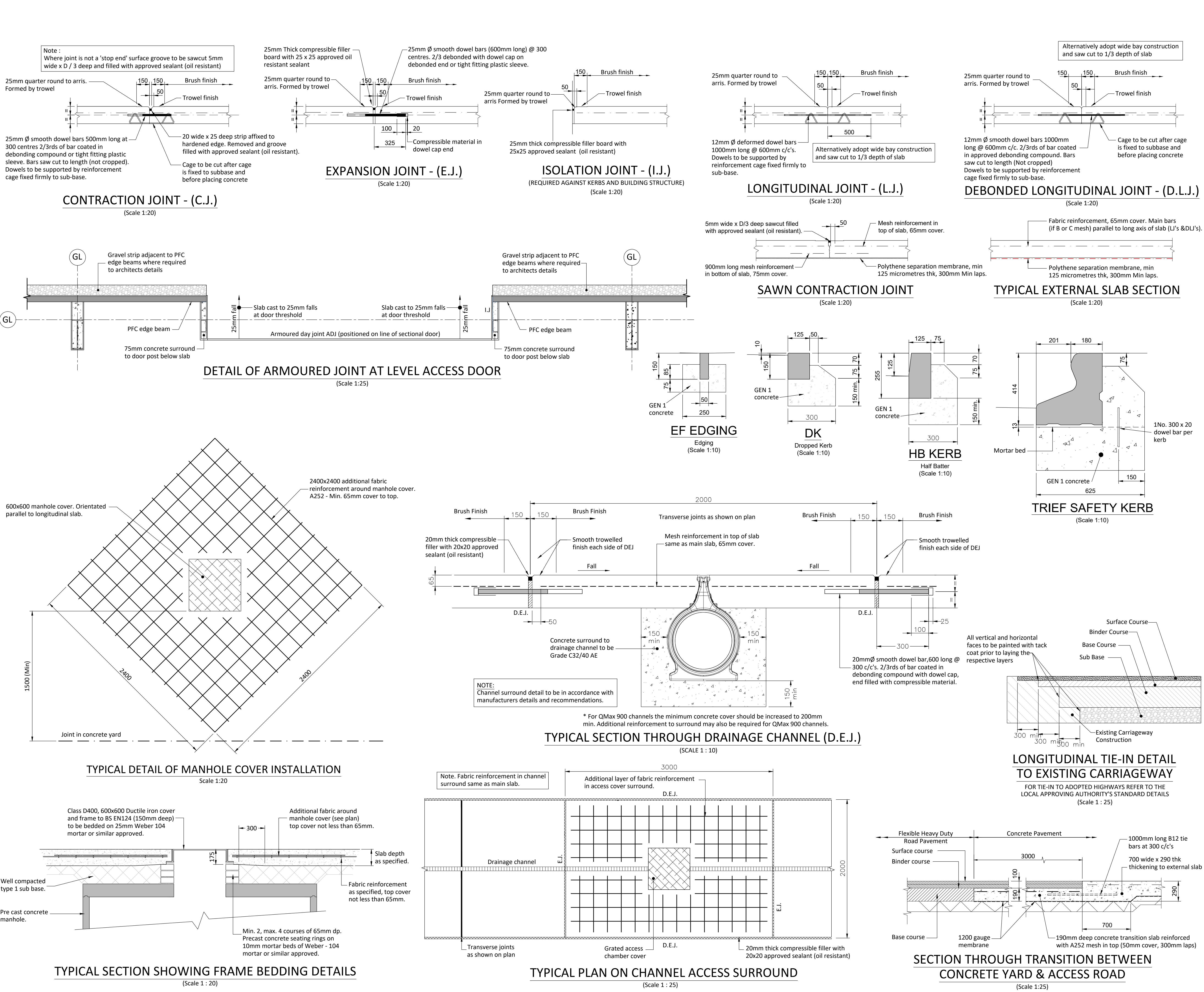
PROJECT
AVENUE ONE LETCHWORTH

DRAWING TITLE
DRAINAGE AND EXTERNAL DETAILS SHEET 2

OUR PROJECT NUMBER	DRAWING STATUS	OFFICE
40365	TENDER	SOUTH
SCALE @ A1	DATE	DRAWN BY
1:100	26.06.2025	GL
		CHECKED BY
		RM

DRAWING No	REV
40365-BGL-XX-XX-DR-C-00222	T01

OUR PROJECT NUMBER 40365		DRAWING STATUS TENDER		OFFICE SOUTH	
SCALE @ A1 1:100		DATE 26.06.2025		DRAWN BY GL	
				CHECKED BY RM	
DRAWING No 40365-BGL-XX-XX-DR-C-00223					REV T02



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CONSTRUCTION

MAINTENANCE

DEMOLITION

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT

General Notes:

1. This drawing shall be read in conjunction with all the relevant Architects, Engineers' and Service Engineers drawings & specifications.

2. For all buried concrete design sulphate and ACEC classes of DS-1 and AC-1s for Made Ground, Reworked Natural, Holywell Nodular Chalk and New Pit Chalk Formation up to a maximum depth of 18m. Refer to TRC Intrusive Geoenvironmental and Geotechnical Site Assessment dated May 2025.

T01	26.06.25	GL	Issued for Tender	RM
REV	DATE	BY	REVISION	CHKD

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WRENBRIDGE

PROJECT
AVENUE ONE
LETCWORTH

DRAWING TITLE
DRAINAGE AND EXTERNAL DETAILS
SHEET 4

OUR PROJECT NUMBER 40365	DRAWING STATUS TENDER	OFFICE SOUTH
SCALE @ A1 AS NOTED	DATE 26.06.2025	DRAWN BY GL
DRAWING No 40365-BGL-XX-XX-DR-C-00224	CHECKED BY RM	REV T01

APPENDIX B – DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	10	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	150.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWMH04	0.343	5.00	81.805	1500	523274.069	232877.624	2.285
DC01	0.035	5.00	80.250	450	523328.204	232941.119	0.950
DC02	0.228	5.00	80.800	450	523336.294	232925.279	1.200
SWMH01			80.924	1500	523336.161	232921.532	2.074
PI01			81.300	1500	523326.636	232917.652	2.580
SWMH02			81.014	1500	523314.845	232913.231	2.324
SWMH05			81.394	1800	523298.188	232906.980	2.834
DC03	0.019	5.00	80.600	450	523257.831	232930.338	0.900
DC04	0.202	5.00	81.185	450	523274.604	232934.723	1.285
SWMH06			81.306	1350	523278.222	232938.127	2.056
PI02			81.300	1350	523275.130	232946.514	2.180
SWMH07	0.000		81.305	1350	523271.634	232955.320	2.225
SWMH08			81.395	1500	523275.381	232967.632	2.965
SWMH09	0.296	5.00	81.735	1350	523244.384	232962.863	2.235
TANK01			81.300	1350	523253.114	232965.955	2.500
SWMH10	0.045	5.00	81.274	1350	523257.748	232980.239	2.524
SWMH11	0.487	5.00	81.457	1350	523275.951	232987.072	1.957
SWMH12			81.374	1800	523269.027	232984.439	2.984
Entrance Gulley	0.000	5.00	80.300	600	523172.234	232978.465	0.760
SWMH13	0.050	5.00	80.993	1500	523194.779	232980.549	1.693
SWMH14	0.050	5.00	81.268	1500	523229.191	232989.455	2.078
SWMH15			81.265	1800	523263.741	232998.422	2.905
TANK02			80.900	1500	523300.129	233014.972	2.620
SWMH16	0.100	5.00	80.807	1350	523329.108	233033.903	1.207
SWMH17			80.873	1800	523332.219	233026.252	2.663
SWMH18	0.129	5.00	81.236	1500	523347.386	233015.789	1.696
SWMH19			80.814	1800	523343.931	233028.990	2.654
EXMH3052			80.050	1350	523350.768	233047.765	1.950

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	SWMH04	SWMH05	37.993	0.600	79.520	78.800	0.720	52.8	450	5.23	106.5
1.000	DC01	SWMH01	21.142	0.600	79.300	79.150	0.150	140.9	225	5.32	105.7
2.000	DC02	SWMH01	3.749	0.600	79.600	79.500	0.100	37.5	300	5.02	108.0
1.001	SWMH01	PI01	10.285	0.600	78.850	78.820	0.030	342.8	450	5.48	104.5
1.002	PI01	SWMH02	12.593	0.600	78.720	78.690	0.030	419.8	450	5.69	102.9
1.003	SWMH02	SWMH05	17.791	0.600	78.690	78.640	0.050	355.8	450	5.97	100.8
1.004	SWMH05	SWMH08	64.798	0.600	78.560	78.430	0.130	498.4	600	6.96	93.8
4.000	DC03	SWMH06	21.828	0.600	79.700	79.480	0.220	99.2	150	5.36	105.4
5.000	DC04	SWMH06	4.968	0.600	79.900	79.800	0.100	49.7	300	5.04	107.9
4.001	SWMH06	PI02	8.939	0.600	79.250	79.220	0.030	298.0	375	5.50	104.4
4.002	PI02	SWMH07	9.475	0.600	79.120	79.080	0.040	236.9	375	5.64	103.3
4.003	SWMH07	SWMH08	12.870	0.600	79.080	78.750	0.330	39.0	375	5.71	102.8
1.005	SWMH08	SWMH12	17.968	0.600	78.430	78.390	0.040	449.2	600	7.23	92.2
6.000	SWMH09	TANK01	9.261	0.600	79.500	79.470	0.030	308.7	375	5.15	107.0
6.001	TANK01	SWMH10	15.017	0.600	78.800	78.750	0.050	300.3	375	5.39	105.2
6.002	SWMH10	SWMH12	12.036	0.600	78.750	78.710	0.040	300.9	375	5.58	103.7
7.000	SWMH11	SWMH12	7.408	0.600	79.500	78.630	0.870	8.5	450	5.02	108.1
1.006	SWMH12	SWMH15	14.949	0.600	78.390	78.360	0.030	498.3	600	7.46	90.8
8.000	Entrance Gully	SWMH13	22.641	0.600	79.540	79.389	0.151	150.0	150	5.46	104.7
8.001	SWMH13	SWMH14	35.546	0.600	79.300	79.190	0.110	323.1	450	5.99	100.7
8.002	SWMH14	SWMH15	35.695	0.600	79.190	78.600	0.590	60.5	450	6.22	99.1
1.007	SWMH15	TANK02	39.975	0.600	78.360	78.280	0.080	499.7	600	8.07	87.1
1.008	TANK02	SWMH17	34.015	0.600	78.280	78.210	0.070	485.9	600	8.59	84.4
9.000	SWMH16	SWMH17	8.259	0.600	79.600	78.630	0.970	8.5	375	5.02	108.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
3.000	2.803	445.8	132.0	1.835	2.144	0.343	0.0
1.000	1.099	43.7	13.4	0.725	1.549	0.035	0.0
2.000	2.575	182.0	89.0	0.900	1.124	0.228	0.0
1.001	1.092	173.7	99.4	1.624	2.030	0.263	0.0
1.002	0.986	156.8	97.8	2.130	1.874	0.263	0.0
1.003	1.072	170.4	95.8	1.874	2.304	0.263	0.0
1.004	1.084	306.4	205.5	2.234	2.365	0.606	0.0
4.000	1.009	17.8	7.2	0.750	1.676	0.019	0.0
5.000	2.236	158.0	78.8	0.985	1.206	0.202	0.0
4.001	1.044	115.3	83.3	1.681	1.705	0.221	0.0
4.002	1.173	129.5	82.5	1.805	1.850	0.221	0.0
4.003	2.909	321.2	82.1	1.850	2.270	0.221	0.0
1.005	1.142	322.9	275.6	2.365	2.384	0.827	0.0
6.000	1.026	113.3	114.5	1.860	1.455	0.296	0.0
6.001	1.040	114.9	112.5	2.125	2.149	0.296	0.0
6.002	1.039	114.8	127.8	2.149	2.289	0.341	0.0
7.000	6.998	1113.0	190.2	1.507	2.294	0.487	0.0
1.006	1.084	306.4	543.2	2.384	2.305	1.655	0.0
8.000	0.818	14.5	0.0	0.610	1.454	0.000	0.0
8.001	1.125	179.0	18.2	1.243	1.628	0.050	0.0
8.002	2.617	416.2	35.8	1.628	2.215	0.100	0.0
1.007	1.082	306.0	552.7	2.305	2.020	1.755	0.0
1.008	1.098	310.4	535.3	2.020	2.063	1.755	0.0
9.000	6.240	689.2	39.0	0.832	1.868	0.100	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.009	SWMH17	SWMH19	12.028	0.600	78.210	78.160	0.050	240.6	600	8.72	83.7
10.000	SWMH18	SWMH19	13.646	0.600	79.540	78.160	1.380	9.9	450	5.04	107.9
1.010	SWMH19	EXMH3052	19.981	0.600	78.160	78.100	0.060	333.0	375	9.05	82.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.009	1.565	442.6	561.3	2.063	2.054	1.855	0.0
10.000	6.493	1032.6	50.3	1.246	2.204	0.129	0.0
1.010	0.987	109.0	587.8	2.279	1.575	1.984	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	37.993	52.8	450	Circular	81.805	79.520	1.835	81.394	78.800	2.144
1.000	21.142	140.9	225	Circular	80.250	79.300	0.725	80.924	79.150	1.549
2.000	3.749	37.5	300	Circular	80.800	79.600	0.900	80.924	79.500	1.124
1.001	10.285	342.8	450	Circular	80.924	78.850	1.624	81.300	78.820	2.030
1.002	12.593	419.8	450	Circular	81.300	78.720	2.130	81.014	78.690	1.874
1.003	17.791	355.8	450	Circular	81.014	78.690	1.874	81.394	78.640	2.304
1.004	64.798	498.4	600	Circular	81.394	78.560	2.234	81.395	78.430	2.365
4.000	21.828	99.2	150	Circular	80.600	79.700	0.750	81.306	79.480	1.676
5.000	4.968	49.7	300	Circular	81.185	79.900	0.985	81.306	79.800	1.206
4.001	8.939	298.0	375	Circular	81.306	79.250	1.681	81.300	79.220	1.705
4.002	9.475	236.9	375	Circular	81.300	79.120	1.805	81.305	79.080	1.850
4.003	12.870	39.0	375	Circular	81.305	79.080	1.850	81.395	78.750	2.270
1.005	17.968	449.2	600	Circular	81.395	78.430	2.365	81.374	78.390	2.384
6.000	9.261	308.7	375	Circular	81.735	79.500	1.860	81.300	79.470	1.455
6.001	15.017	300.3	375	Circular	81.300	78.800	2.125	81.274	78.750	2.149
6.002	12.036	300.9	375	Circular	81.274	78.750	2.149	81.374	78.710	2.289
7.000	7.408	8.5	450	Circular	81.457	79.500	1.507	81.374	78.630	2.294

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.000	SWMH04	1500	Manhole	Adoptable	SWMH05	1800	Manhole	Adoptable
1.000	DC01	450	Manhole	Adoptable	SWMH01	1500	Manhole	Adoptable
2.000	DC02	450	Manhole	Adoptable	SWMH01	1500	Manhole	Adoptable
1.001	SWMH01	1500	Manhole	Adoptable	PI01	1500	Manhole	Adoptable
1.002	PI01	1500	Manhole	Adoptable	SWMH02	1500	Manhole	Adoptable
1.003	SWMH02	1500	Manhole	Adoptable	SWMH05	1800	Manhole	Adoptable
1.004	SWMH05	1800	Manhole	Adoptable	SWMH08	1500	Manhole	Adoptable
4.000	DC03	450	Manhole	Adoptable	SWMH06	1350	Manhole	Adoptable
5.000	DC04	450	Manhole	Adoptable	SWMH06	1350	Manhole	Adoptable
4.001	SWMH06	1350	Manhole	Adoptable	PI02	1350	Manhole	Adoptable
4.002	PI02	1350	Manhole	Adoptable	SWMH07	1350	Manhole	Adoptable
4.003	SWMH07	1350	Manhole	Adoptable	SWMH08	1500	Manhole	Adoptable
1.005	SWMH08	1500	Manhole	Adoptable	SWMH12	1800	Manhole	Adoptable
6.000	SWMH09	1350	Manhole	Adoptable	TANK01	1350	Manhole	Adoptable
6.001	TANK01	1350	Manhole	Adoptable	SWMH10	1350	Manhole	Adoptable
6.002	SWMH10	1350	Manhole	Adoptable	SWMH12	1800	Manhole	Adoptable
7.000	SWMH11	1350	Manhole	Adoptable	SWMH12	1800	Manhole	Adoptable

Pipeline Schedule

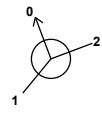
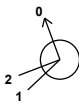
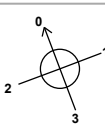
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.006	14.949	498.3	600	Circular	81.374	78.390	2.384	81.265	78.360	2.305
8.000	22.641	150.0	150	Circular	80.300	79.540	0.610	80.993	79.389	1.454
8.001	35.546	323.1	450	Circular	80.993	79.300	1.243	81.268	79.190	1.628
8.002	35.695	60.5	450	Circular	81.268	79.190	1.628	81.265	78.600	2.215
1.007	39.975	499.7	600	Circular	81.265	78.360	2.305	80.900	78.280	2.020
1.008	34.015	485.9	600	Circular	80.900	78.280	2.020	80.873	78.210	2.063
9.000	8.259	8.5	375	Circular	80.807	79.600	0.832	80.873	78.630	1.868
1.009	12.028	240.6	600	Circular	80.873	78.210	2.063	80.814	78.160	2.054
10.000	13.646	9.9	450	Circular	81.236	79.540	1.246	80.814	78.160	2.204
1.010	19.981	333.0	375	Circular	80.814	78.160	2.279	80.050	78.100	1.575

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	SWMH12	1800	Manhole	Adoptable	SWMH15	1800	Manhole	Adoptable
8.000	Entrance Gully	600	Manhole	Adoptable	SWMH13	1500	Manhole	Adoptable
8.001	SWMH13	1500	Manhole	Adoptable	SWMH14	1500	Manhole	Adoptable
8.002	SWMH14	1500	Manhole	Adoptable	SWMH15	1800	Manhole	Adoptable
1.007	SWMH15	1800	Manhole	Adoptable	TANK02	1500	Manhole	Adoptable
1.008	TANK02	1500	Manhole	Adoptable	SWMH17	1800	Manhole	Adoptable
9.000	SWMH16	1350	Manhole	Adoptable	SWMH17	1800	Manhole	Adoptable
1.009	SWMH17	1800	Manhole	Adoptable	SWMH19	1800	Manhole	Adoptable
10.000	SWMH18	1500	Manhole	Adoptable	SWMH19	1800	Manhole	Adoptable
1.010	SWMH19	1800	Manhole	Adoptable	EXMH3052	1350	Manhole	Adoptable

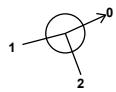
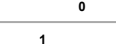
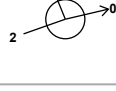
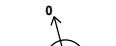
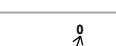
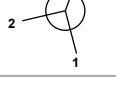
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SWMH04	523274.069	232877.624	81.805	2.285	1500					
						0	3.000	79.520	450	
DC01	523328.204	232941.119	80.250	0.950	450					
						0	1.000	79.300	225	
DC02	523336.294	232925.279	80.800	1.200	450					
						0	2.000	79.600	300	
SWMH01	523336.161	232921.532	80.924	2.074	1500		1	2.000	79.500	300
						2	1.000	79.150	225	
						0	1.001	78.850	450	
PI01	523326.636	232917.652	81.300	2.580	1500		1	1.001	78.820	450
						0	1.002	78.720	450	
SWMH02	523314.845	232913.231	81.014	2.324	1500		1	1.002	78.690	450
						0	1.003	78.690	450	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SWMH05	523298.188	232906.980	81.394	2.834	1800		1	3.000	78.800	450
						2	1.003	78.640	450	
						0	1.004	78.560	600	
DC03	523257.831	232930.338	80.600	0.900	450		0	4.000	79.700	150
DC04	523274.604	232934.723	81.185	1.285	450		0	5.000	79.900	300
SWMH06	523278.222	232938.127	81.306	2.056	1350		1	5.000	79.800	300
						2	4.000	79.480	150	
						0	4.001	79.250	375	
PI02	523275.130	232946.514	81.300	2.180	1350		1	4.001	79.220	375
						0	4.002	79.120	375	
						1	4.002	79.080	375	
SWMH07	523271.634	232955.320	81.305	2.225	1350		1	4.002	79.080	375
						0	4.003	79.080	375	
						1	4.003	78.750	375	
SWMH08	523275.381	232967.632	81.395	2.965	1500		1	4.003	78.750	375
						2	1.004	78.430	600	
						0	1.005	78.430	600	
SWMH09	523244.384	232962.863	81.735	2.235	1350		0	6.000	79.500	375
						1	6.000	79.470	375	
						0	6.001	78.800	375	
SWMH10	523257.748	232980.239	81.274	2.524	1350		1	6.001	78.750	375
						0	6.002	78.750	375	
						0	7.000	79.500	450	
SWMH12	523269.027	232984.439	81.374	2.984	1800		1	7.000	78.630	450
						2	6.002	78.710	375	
						3	1.005	78.390	600	
						0	1.006	78.390	600	
Entrance Gulley	523172.234	232978.465	80.300	0.760	600		0	8.000	79.540	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWMH13	523194.779	232980.549	80.993	1.693	1500		1 8.000	79.389	150
							0 8.001	79.300	450
SWMH14	523229.191	232989.455	81.268	2.078	1500		1 8.001	79.190	450
							0 8.002	79.190	450
SWMH15	523263.741	232998.422	81.265	2.905	1800		1 8.002	78.600	450
							2 1.006	78.360	600
							0 1.007	78.360	600
TANK02	523300.129	233014.972	80.900	2.620	1500		1 1.007	78.280	600
							0 1.008	78.280	600
SWMH16	523329.108	233033.903	80.807	1.207	1350		0 9.000	79.600	375
SWMH17	523332.219	233026.252	80.873	2.663	1800		1 9.000	78.630	375
							2 1.008	78.210	600
							0 1.009	78.210	600
SWMH18	523347.386	233015.789	81.236	1.696	1500		0 10.000	79.540	450
SWMH19	523343.931	233028.990	80.814	2.654	1800		1 10.000	78.160	450
							2 1.009	78.160	600
							0 1.010	78.160	375
EXMH3052	523350.768	233047.765	80.050	1.950	1350		1 1.010	78.100	375

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s) x
Summer CV	1.000	Drain Down Time (mins)	5760	Check Discharge Volume x
Winter CV	1.000	Additional Storage (m³/ha)	0.0	

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	35	0	0
100	40	0	0

Node SWMH19 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	78.160	Product Number	CTL-SHE-0102-6200-2050-6200
Design Depth (m)	2.050	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.2	Min Node Diameter (mm)	1200

Node TANK02 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	78.280
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	3165

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	645.0	0.0	1.600	645.0	0.0	1.601	0.0	0.0

Node TANK01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	78.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	1980

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	501.0	0.0	1.200	501.0	0.0	1.201	0.0	0.0

Node SWMH10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	80.770	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.33	Length (m)	22.500		

Node SWMH04 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	80.750	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.33	Length (m)	27.500		

Node SWMH16 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	80.240	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.450
Safety Factor	2.0	Width (m)	74.000	Inf Depth (m)	
Porosity	0.33	Length (m)	5.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH04	10	79.606	0.086	34.7	0.1515	0.0000	OK
15 minute summer	DC01	10	79.343	0.043	3.5	0.0069	0.0000	OK
15 minute summer	DC02	10	79.685	0.085	23.1	0.0136	0.0000	OK
15 minute summer	SWMH01	10	78.974	0.124	26.5	0.2190	0.0000	OK
15 minute summer	PI01	12	78.901	0.181	26.2	0.3193	0.0000	OK
15 minute summer	SWMH02	12	78.884	0.194	25.9	0.3434	0.0000	OK
15 minute summer	SWMH05	12	78.876	0.316	59.0	0.8046	0.0000	OK
15 minute summer	DC03	10	79.733	0.033	1.9	0.0053	0.0000	OK
15 minute summer	DC04	10	79.983	0.083	20.4	0.0132	0.0000	OK
15 minute summer	SWMH06	10	79.368	0.118	22.2	0.1687	0.0000	OK
15 minute summer	PI02	10	79.225	0.105	22.0	0.1500	0.0000	OK
15 minute summer	SWMH07	10	79.149	0.069	21.8	0.0994	0.0000	OK
15 minute summer	SWMH08	12	78.860	0.430	90.2	0.7592	0.0000	OK
15 minute summer	SWMH09	10	79.639	0.139	30.0	0.1995	0.0000	OK
240 minute summer	TANK01	148	78.854	0.054	11.9	25.5836	0.0000	OK
15 minute summer	SWMH10	12	78.853	0.103	6.5	0.1467	0.0000	OK
15 minute summer	SWMH11	9	79.568	0.068	49.3	0.0968	0.0000	OK
15 minute summer	SWMH12	12	78.848	0.458	144.0	1.1646	0.0000	OK
15 minute summer	Entrance Gully	1	79.540	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SWMH13	10	79.352	0.052	5.1	0.0925	0.0000	OK
15 minute summer	SWMH14	11	79.237	0.047	10.0	0.0836	0.0000	OK
15 minute summer	SWMH15	11	78.828	0.468	168.6	1.1912	0.0000	OK
480 minute winter	TANK02	456	78.653	0.373	27.0	229.2735	0.0000	OK
15 minute summer	SWMH16	10	79.633	0.033	10.1	0.0469	0.0000	OK
480 minute winter	SWMH17	456	78.653	0.443	5.2	1.1276	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH04	3.000	SWMH05	34.2	1.663	0.077	0.7806	
15 minute summer	DC01	1.000	SWMH01	3.4	0.655	0.079	0.1115	
15 minute summer	DC02	2.000	SWMH01	23.0	1.575	0.127	0.0549	
15 minute summer	SWMH01	1.001	PI01	26.2	0.803	0.151	0.3356	
15 minute summer	PI01	1.002	SWMH02	25.9	0.711	0.165	0.7871	
15 minute summer	SWMH02	1.003	SWMH05	24.9	0.730	0.146	1.3322	
15 minute summer	SWMH05	1.004	SWMH08	75.6	0.561	0.247	11.8744	
15 minute summer	DC03	4.000	SWMH06	1.8	0.650	0.104	0.0621	
15 minute summer	DC04	5.000	SWMH06	20.3	1.413	0.129	0.0716	
15 minute summer	SWMH06	4.001	PI02	22.0	0.799	0.190	0.2460	
15 minute summer	PI02	4.002	SWMH07	21.8	1.148	0.169	0.1855	
15 minute summer	SWMH07	4.003	SWMH08	22.3	1.617	0.070	0.2493	
15 minute summer	SWMH08	1.005	SWMH12	114.0	0.707	0.353	4.0122	
15 minute summer	SWMH09	6.000	TANK01	29.7	0.864	0.262	0.3186	
240 minute summer	TANK01	6.001	SWMH10	4.9	0.485	0.043	0.1546	
240 minute summer	SWMH10	6.002	SWMH12	5.9	0.566	0.051	0.1249	
15 minute summer	SWMH11	7.000	SWMH12	49.2	3.101	0.044	0.3240	
15 minute summer	SWMH12	1.006	SWMH15	161.5	0.928	0.527	3.4775	
15 minute summer	Entrance Gully	8.000	SWMH13	0.0	0.000	0.000	0.0000	
15 minute summer	SWMH13	8.001	SWMH14	5.0	0.523	0.028	0.3375	
15 minute summer	SWMH14	8.002	SWMH15	9.8	0.874	0.024	1.5959	
15 minute summer	SWMH15	1.007	TANK02	200.8	2.340	0.656	4.7531	
15 minute summer	TANK02	1.008	SWMH17	-16.1	-0.445	-0.052	1.7353	
15 minute summer	SWMH16	9.000	SWMH17	10.1	2.224	0.015	0.0374	
15 minute summer	SWMH17	1.009	SWMH19	-6.5	0.152	-0.015	1.1454	

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH18	10	79.575	0.035	13.1	0.0623	0.0000	OK
480 minute winter	SWMH19	456	78.653	0.493	5.5	1.2548	0.0000	SURCHARGED
480 minute winter	EXMH3052	456	78.151	0.051	5.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH18	10.000	SWMH19	13.0	1.257	0.013	0.6424	
480 minute winter	SWMH19	1.010	EXMH3052	5.3	0.542	0.049	0.1972	382.2

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH04	10	79.630	0.110	57.6	0.1945	0.0000	OK
15 minute summer	DC01	10	79.357	0.057	5.9	0.0090	0.0000	OK
15 minute summer	DC02	10	79.715	0.115	38.3	0.0183	0.0000	OK
15 minute summer	SWMH01	12	79.031	0.181	44.0	0.3198	0.0000	OK
15 minute summer	PI01	12	79.011	0.291	43.6	0.5139	0.0000	OK
15 minute summer	SWMH02	12	78.998	0.308	42.8	0.5446	0.0000	OK
15 minute summer	SWMH05	11	79.002	0.442	99.2	1.1244	0.0000	OK
15 minute summer	DC03	10	79.743	0.043	3.2	0.0069	0.0000	OK
15 minute summer	DC04	10	80.011	0.111	33.9	0.0176	0.0000	OK
15 minute summer	SWMH06	10	79.406	0.156	36.9	0.2228	0.0000	OK
15 minute summer	PI02	10	79.255	0.135	36.6	0.1936	0.0000	OK
15 minute summer	SWMH07	9	79.166	0.086	36.4	0.1226	0.0000	OK
15 minute summer	SWMH08	11	78.974	0.544	164.3	0.9615	0.0000	OK
15 minute summer	SWMH09	10	79.685	0.185	49.7	0.2642	0.0000	OK
240 minute summer	TANK01	144	78.869	0.069	16.8	32.9984	0.0000	OK
15 minute summer	SWMH10	11	78.961	0.211	19.0	0.3025	0.0000	OK
15 minute summer	SWMH11	10	79.581	0.081	81.7	0.1165	0.0000	OK
15 minute summer	SWMH12	11	78.955	0.565	244.1	1.4376	0.0000	OK
15 minute summer	Entrance Gulley	1	79.540	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SWMH13	10	79.367	0.067	8.4	0.1180	0.0000	OK
15 minute summer	SWMH14	11	79.250	0.060	16.6	0.1064	0.0000	OK
15 minute summer	SWMH15	11	78.918	0.558	267.4	1.4204	0.0000	OK
600 minute winter	TANK02	585	78.826	0.546	30.4	335.8279	0.0000	OK
15 minute summer	SWMH16	10	79.642	0.042	16.8	0.0605	0.0000	OK
600 minute winter	SWMH17	585	78.826	0.616	5.2	1.5689	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH04	3.000	SWMH05	58.6	1.859	0.132	1.8443	
15 minute summer	DC01	1.000	SWMH01	5.8	0.757	0.132	0.1617	
15 minute summer	DC02	2.000	SWMH01	38.2	1.771	0.210	0.0810	
15 minute summer	SWMH01	1.001	PI01	43.6	0.920	0.251	0.6354	
15 minute summer	PI01	1.002	SWMH02	42.8	0.778	0.273	1.4109	
15 minute summer	SWMH02	1.003	SWMH05	52.4	0.738	0.307	2.2415	
15 minute summer	SWMH05	1.004	SWMH08	132.1	0.647	0.431	15.9092	
15 minute summer	DC03	4.000	SWMH06	3.1	0.752	0.175	0.0905	
15 minute summer	DC04	5.000	SWMH06	33.8	1.597	0.214	0.1052	
15 minute summer	SWMH06	4.001	PI02	36.6	0.917	0.317	0.3566	
15 minute summer	PI02	4.002	SWMH07	36.4	1.357	0.281	0.2586	
15 minute summer	SWMH07	4.003	SWMH08	36.4	1.692	0.113	0.5604	
15 minute summer	SWMH08	1.005	SWMH12	185.0	0.828	0.573	4.8850	
15 minute summer	SWMH09	6.000	TANK01	49.3	0.995	0.435	0.4585	
15 minute summer	TANK01	6.001	SWMH10	-20.6	-0.678	-0.180	0.5099	
15 minute summer	SWMH10	6.002	SWMH12	-11.8	0.584	-0.103	0.8437	
15 minute summer	SWMH11	7.000	SWMH12	81.7	3.123	0.073	0.5238	
15 minute summer	SWMH12	1.006	SWMH15	252.5	1.165	0.824	4.0982	
15 minute summer	Entrance Gulley	8.000	SWMH13	0.0	0.000	0.000	0.0000	
15 minute summer	SWMH13	8.001	SWMH14	8.2	0.607	0.046	0.4800	
15 minute summer	SWMH14	8.002	SWMH15	16.4	0.923	0.039	2.3625	
15 minute summer	SWMH15	1.007	TANK02	303.5	2.636	0.992	5.5648	
15 minute summer	TANK02	1.008	SWMH17	-36.4	-0.644	-0.117	3.0526	
15 minute summer	SWMH16	9.000	SWMH17	16.7	2.567	0.024	0.0539	
15 minute summer	SWMH17	1.009	SWMH19	-16.7	0.160	-0.038	1.6037	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH18	10	79.585	0.045	21.7	0.0789	0.0000	OK
600 minute winter	SWMH19	585	78.826	0.666	5.7	1.6961	0.0000	SURCHARGED
120 minute winter	EXMH3052	112	78.151	0.051	5.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH18	10.000	SWMH19	21.6	1.344	0.021	0.8581	
120 minute winter	SWMH19	1.010	EXMH3052	5.3	0.542	0.049	0.1972	324.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH04	10	79.720	0.200	158.2	0.3529	0.0000	OK
15 minute summer	DC01	9	79.864	0.564	16.2	0.0897	0.0000	SURCHARGED
15 minute summer	DC02	10	79.844	0.244	105.2	0.0388	0.0000	OK
15 minute summer	SWMH01	10	79.733	0.883	121.3	1.5598	0.0000	SURCHARGED
15 minute summer	PI01	10	79.701	0.981	123.5	1.7337	0.0000	SURCHARGED
15 minute summer	SWMH02	10	79.665	0.975	127.0	1.7220	0.0000	SURCHARGED
15 minute summer	SWMH05	10	79.618	1.058	285.3	2.6928	0.0000	SURCHARGED
15 minute summer	DC03	10	79.774	0.074	8.8	0.0118	0.0000	OK
15 minute summer	DC04	10	80.111	0.211	93.1	0.0335	0.0000	OK
15 minute summer	SWMH06	10	79.654	0.404	101.7	0.5776	0.0000	SURCHARGED
15 minute summer	PI02	10	79.606	0.486	102.9	0.6948	0.0000	SURCHARGED
15 minute summer	SWMH07	10	79.554	0.474	108.4	0.6778	0.0000	SURCHARGED
15 minute summer	SWMH08	10	79.487	1.057	414.4	1.8671	0.0000	SURCHARGED
15 minute summer	SWMH09	10	79.850	0.350	136.5	0.5003	0.0000	OK
720 minute winter	TANK01	705	79.295	0.495	27.3	236.4324	0.0000	SURCHARGED
720 minute winter	SWMH10	705	79.295	0.545	18.1	0.7803	0.0000	SURCHARGED
15 minute summer	SWMH11	10	79.686	0.186	224.7	0.2655	0.0000	OK
15 minute summer	SWMH12	10	79.383	0.993	633.3	2.5273	0.0000	SURCHARGED
15 minute summer	Entrance Gulley	1	79.540	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SWMH13	10	79.411	0.111	23.1	0.1953	0.0000	OK
720 minute winter	SWMH14	705	79.295	0.105	3.4	0.1859	0.0000	OK
720 minute winter	SWMH15	705	79.295	0.935	48.3	2.3802	0.0000	SURCHARGED
720 minute winter	TANK02	705	79.295	1.015	48.2	623.8770	0.0000	SURCHARGED
15 minute summer	SWMH16	10	79.672	0.072	46.2	0.1024	0.0000	OK
720 minute winter	SWMH17	705	79.295	1.085	5.2	2.7619	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH04	3.000	SWMH05	156.3	1.981	0.351	4.2998	
15 minute winter	DC01	1.000	SWMH01	29.4	0.887	0.672	0.8408	
15 minute summer	DC02	2.000	SWMH01	105.3	2.186	0.578	0.2251	
15 minute summer	SWMH01	1.001	PI01	123.5	0.953	0.711	1.6296	
15 minute summer	PI01	1.002	SWMH02	127.0	0.829	0.810	1.9953	
15 minute summer	SWMH02	1.003	SWMH05	131.0	0.827	0.769	2.8189	
15 minute summer	SWMH05	1.004	SWMH08	303.4	1.077	0.990	18.2521	
15 minute summer	DC03	4.000	SWMH06	8.7	0.958	0.491	0.2865	
15 minute summer	DC04	5.000	SWMH06	93.0	2.011	0.588	0.2290	
15 minute summer	SWMH06	4.001	PI02	102.9	1.212	0.893	0.9859	
15 minute summer	PI02	4.002	SWMH07	108.4	1.630	0.837	1.0451	
15 minute summer	SWMH07	4.003	SWMH08	111.9	1.684	0.348	1.4195	
15 minute summer	SWMH08	1.005	SWMH12	417.8	1.484	1.294	5.0612	
15 minute summer	SWMH09	6.000	TANK01	135.7	1.390	1.198	0.8918	
15 minute summer	TANK01	6.001	SWMH10	-159.9	-2.044	-1.392	1.1369	
15 minute summer	SWMH10	6.002	SWMH12	-134.4	-1.219	-1.172	1.3275	
15 minute summer	SWMH11	7.000	SWMH12	224.5	3.322	0.202	0.8151	
15 minute summer	SWMH12	1.006	SWMH15	506.2	1.797	1.652	4.2108	
15 minute summer	Entrance Gulley	8.000	SWMH13	0.0	0.000	0.000	0.0176	
15 minute summer	SWMH13	8.001	SWMH14	22.7	0.816	0.127	0.9911	
15 minute summer	SWMH14	8.002	SWMH15	45.0	0.871	0.108	3.2848	
15 minute summer	SWMH15	1.007	TANK02	573.4	2.858	1.874	8.9910	
15 minute summer	TANK02	1.008	SWMH17	-117.7	-1.134	-0.379	8.8502	
15 minute summer	SWMH16	9.000	SWMH17	46.1	3.368	0.067	0.1612	
15 minute summer	SWMH17	1.009	SWMH19	-60.0	-0.297	-0.135	3.3476	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH18	10	79.612	0.072	59.6	0.1278	0.0000	OK
720 minute winter	SWMH19	705	79.295	1.135	5.8	2.8891	0.0000	SURCHARGED
30 minute summer	EXMH3052	21	78.151	0.051	5.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH18	10.000	SWMH19	59.4	1.150	0.058	1.1875	
30 minute summer	SWMH19	1.010	EXMH3052	5.3	0.542	0.049	0.1972	504.8

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH04	10	80.205	0.685	213.6	1.2108	0.0000	SURCHARGED
15 minute summer	DC01	11	80.246	0.946	27.9	0.1504	0.0000	FLOOD RISK
15 minute summer	DC02	11	80.346	0.746	142.0	0.1186	0.0000	SURCHARGED
15 minute summer	SWMH01	11	80.191	1.341	161.3	2.3689	0.0000	SURCHARGED
15 minute summer	PI01	11	80.138	1.418	161.1	2.5051	0.0000	SURCHARGED
15 minute summer	SWMH02	11	80.077	1.387	163.3	2.4509	0.0000	SURCHARGED
15 minute summer	SWMH05	11	80.000	1.440	372.4	3.6660	0.0000	SURCHARGED
15 minute summer	DC03	11	80.154	0.454	11.8	0.0721	0.0000	SURCHARGED
15 minute summer	DC04	10	80.173	0.273	125.8	0.0434	0.0000	OK
15 minute summer	SWMH06	11	80.030	0.780	134.0	1.1167	0.0000	SURCHARGED
15 minute summer	PI02	11	79.951	0.831	135.0	1.1886	0.0000	SURCHARGED
15 minute summer	SWMH07	10	79.869	0.789	136.6	1.1285	0.0000	SURCHARGED
15 minute summer	SWMH08	10	79.782	1.352	514.2	2.3886	0.0000	SURCHARGED
15 minute summer	SWMH09	10	79.953	0.453	184.4	0.6478	0.0000	SURCHARGED
720 minute winter	TANK01	720	79.624	0.824	38.8	393.4935	0.0000	SURCHARGED
720 minute winter	SWMH10	720	79.624	0.874	26.0	1.2511	0.0000	SURCHARGED
15 minute summer	SWMH11	10	79.803	0.303	303.3	0.4336	0.0000	OK
720 minute winter	SWMH12	720	79.624	1.234	56.1	3.1412	0.0000	SURCHARGED
720 minute winter	Entrance Gulley	720	79.624	0.084	0.0	0.0239	0.0000	OK
720 minute winter	SWMH13	720	79.624	0.324	2.2	0.5730	0.0000	OK
720 minute winter	SWMH14	720	79.624	0.434	4.4	0.7673	0.0000	OK
720 minute winter	SWMH15	720	79.624	1.264	55.3	3.2175	0.0000	SURCHARGED
720 minute winter	TANK02	720	79.624	1.344	55.7	826.0610	0.0000	SURCHARGED
15 minute summer	SWMH16	10	79.684	0.084	62.3	0.1208	0.0000	OK
720 minute winter	SWMH17	720	79.624	1.414	5.5	3.5992	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH04	3.000	SWMH05	206.8	1.919	0.464	6.0197	
30 minute summer	DC01	1.000	SWMH01	22.8	0.991	0.522	0.8408	
15 minute summer	DC02	2.000	SWMH01	139.5	2.222	0.766	0.2640	
15 minute summer	SWMH01	1.001	PI01	161.1	1.042	0.928	1.6296	
15 minute summer	PI01	1.002	SWMH02	163.3	1.031	1.042	1.9953	
15 minute summer	SWMH02	1.003	SWMH05	168.9	1.066	0.991	2.8189	
15 minute summer	SWMH05	1.004	SWMH08	375.8	1.334	1.226	18.2521	
15 minute summer	DC03	4.000	SWMH06	14.1	0.955	0.789	0.3843	
15 minute summer	DC04	5.000	SWMH06	124.8	2.108	0.790	0.3108	
15 minute summer	SWMH06	4.001	PI02	135.0	1.228	1.170	0.9859	
15 minute summer	PI02	4.002	SWMH07	136.6	1.491	1.055	1.0451	
15 minute summer	SWMH07	4.003	SWMH08	138.4	1.671	0.431	1.4195	
15 minute summer	SWMH08	1.005	SWMH12	516.2	1.833	1.599	5.0612	
15 minute summer	SWMH09	6.000	TANK01	183.8	1.682	1.622	0.9666	
15 minute summer	TANK01	6.001	SWMH10	-227.4	-2.537	-1.979	1.4522	
15 minute summer	SWMH10	6.002	SWMH12	-198.0	-1.796	-1.726	1.3275	
15 minute summer	SWMH11	7.000	SWMH12	302.0	3.281	0.271	1.0074	
15 minute summer	SWMH12	1.006	SWMH15	612.6	2.175	1.999	4.2108	
360 minute summer	Entrance Gulley	8.000	SWMH13	0.0	0.005	0.003	0.2288	
15 minute summer	SWMH13	8.001	SWMH14	32.0	0.851	0.179	2.0130	
15 minute summer	SWMH14	8.002	SWMH15	80.7	0.941	0.194	4.1351	
15 minute summer	SWMH15	1.007	TANK02	703.4	3.274	2.298	11.1271	
15 minute summer	TANK02	1.008	SWMH17	-150.3	-1.242	-0.484	9.5813	
15 minute summer	SWMH16	9.000	SWMH17	62.1	3.633	0.090	0.3883	
15 minute summer	SWMH17	1.009	SWMH19	-80.1	-0.390	-0.181	3.3880	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	SWMH18	720	79.624	0.084	5.8	0.1488	0.0000	OK
720 minute winter	SWMH19	720	79.624	1.464	5.8	3.7264	0.0000	SURCHARGED
60 minute winter	EXMH3052	31	78.151	0.051	5.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH18	10.000	SWMH19	80.2	1.098	0.078	1.2145	
60 minute winter	SWMH19	1.010	EXMH3052	5.3	0.542	0.049	0.1972	832.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 94.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH04	10	80.749	1.229	280.8	2.1710	0.0000	SURCHARGED
960 minute winter	DC01	870	80.250	0.950	9.5	0.1511	34.4129	FLOOD
15 minute summer	DC02	10	80.785	1.185	186.6	0.1884	0.0000	FLOOD RISK
15 minute summer	SWMH01	11	80.512	1.662	184.9	2.9368	0.0000	SURCHARGED
15 minute summer	PI01	11	80.478	1.758	154.4	3.1065	0.0000	SURCHARGED
15 minute summer	SWMH02	11	80.439	1.749	158.3	3.0898	0.0000	SURCHARGED
15 minute summer	SWMH05	11	80.388	1.828	405.4	4.6513	0.0000	SURCHARGED
15 minute summer	DC03	10	80.600	0.900	15.6	0.1431	0.6474	FLOOD
15 minute summer	DC04	10	80.765	0.865	165.3	0.1375	0.0000	SURCHARGED
15 minute summer	SWMH06	11	80.525	1.275	174.0	1.8247	0.0000	SURCHARGED
15 minute summer	PI02	11	80.399	1.279	171.6	1.8302	0.0000	SURCHARGED
15 minute summer	SWMH07	11	80.267	1.187	171.6	1.6981	0.0000	SURCHARGED
960 minute winter	SWMH08	870	80.260	1.830	35.2	3.2334	0.0000	SURCHARGED
960 minute winter	SWMH09	870	80.259	0.759	13.3	1.0855	0.0000	SURCHARGED
960 minute winter	TANK01	870	80.259	1.459	35.3	573.4659	0.0000	SURCHARGED
960 minute winter	SWMH10	870	80.260	1.510	22.1	2.1609	0.0000	SURCHARGED
960 minute winter	SWMH11	870	80.261	0.761	21.8	1.0883	0.0000	SURCHARGED
960 minute winter	SWMH12	870	80.260	1.870	56.8	4.7598	0.0000	SURCHARGED
960 minute winter	Entrance Gulley	870	80.258	0.718	0.8	0.2031	0.0000	FLOOD RISK
960 minute winter	SWMH13	885	80.257	0.957	11.2	1.6918	0.0000	SURCHARGED
960 minute winter	SWMH14	870	80.258	1.068	7.7	1.8879	0.0000	SURCHARGED
960 minute winter	SWMH15	870	80.260	1.900	43.9	4.8353	0.0000	SURCHARGED
960 minute winter	TANK02	870	80.259	1.979	45.5	984.2036	0.0000	SURCHARGED
960 minute winter	SWMH16	870	80.258	0.658	8.3	1.3570	0.0000	SURCHARGED
960 minute winter	SWMH17	870	80.259	2.049	18.5	5.2140	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH04	3.000	SWMH05	277.0	2.003	0.621	6.0197	
15 minute summer	DC01	1.000	SWMH01	-52.1	-1.311	-1.193	0.8408	
15 minute summer	DC02	2.000	SWMH01	184.9	2.626	1.016	0.2640	
30 minute summer	SWMH01	1.001	PI01	165.7	1.141	0.954	1.6296	
30 minute summer	PI01	1.002	SWMH02	161.0	1.016	1.027	1.9953	
15 minute summer	SWMH02	1.003	SWMH05	170.1	1.073	0.998	2.8189	
15 minute summer	SWMH05	1.004	SWMH08	409.0	1.452	1.335	18.2521	
15 minute summer	DC03	4.000	SWMH06	18.1	1.031	1.018	0.3843	
15 minute summer	DC04	5.000	SWMH06	163.3	2.319	1.033	0.3498	
15 minute summer	SWMH06	4.001	PI02	171.6	1.556	1.488	0.9859	
15 minute summer	PI02	4.002	SWMH07	171.6	1.682	1.325	1.0451	
15 minute summer	SWMH07	4.003	SWMH08	172.9	1.802	0.538	1.4195	
15 minute summer	SWMH08	1.005	SWMH12	583.2	2.071	1.806	5.0612	
15 minute summer	SWMH09	6.000	TANK01	241.6	2.191	2.133	1.0027	
15 minute summer	TANK01	6.001	SWMH10	-288.9	-2.959	-2.515	1.6563	
15 minute summer	SWMH10	6.002	SWMH12	-252.4	-2.288	-2.199	1.3275	
15 minute summer	SWMH11	7.000	SWMH12	395.1	3.514	0.355	1.1737	
15 minute summer	SWMH12	1.006	SWMH15	713.9	2.535	2.330	4.2108	
480 minute summer	Entrance Gulley	8.000	SWMH13	6.9	0.390	0.474	0.3986	
15 minute summer	SWMH13	8.001	SWMH14	50.1	0.788	0.280	4.8298	
15 minute summer	SWMH14	8.002	SWMH15	113.8	1.037	0.273	5.6528	
15 minute summer	SWMH15	1.007	TANK02	813.4	3.525	2.658	11.2600	
15 minute summer	TANK02	1.008	SWMH17	-195.8	-1.503	-0.631	9.5813	
15 minute summer	SWMH16	9.000	SWMH17	81.7	3.883	0.119	0.4557	
15 minute summer	SWMH17	1.009	SWMH19	-101.9	-0.428	-0.230	3.3880	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 94.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	SWMH18	870	80.259	0.719	11.5	1.2708	0.0000	SURCHARGED
960 minute winter	SWMH19	870	80.259	2.099	11.5	5.3415	0.0000	SURCHARGED
960 minute winter	EXMH3052	870	78.155	0.055	6.2	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH18	10.000	SWMH19	105.4	1.047	0.102	1.2488	
960 minute winter	SWMH19	1.010	EXMH3052	6.2	0.567	0.057	0.2186	1974.7

APPENDIX C – MANUFACTURER INFORMATION

Technical Specification

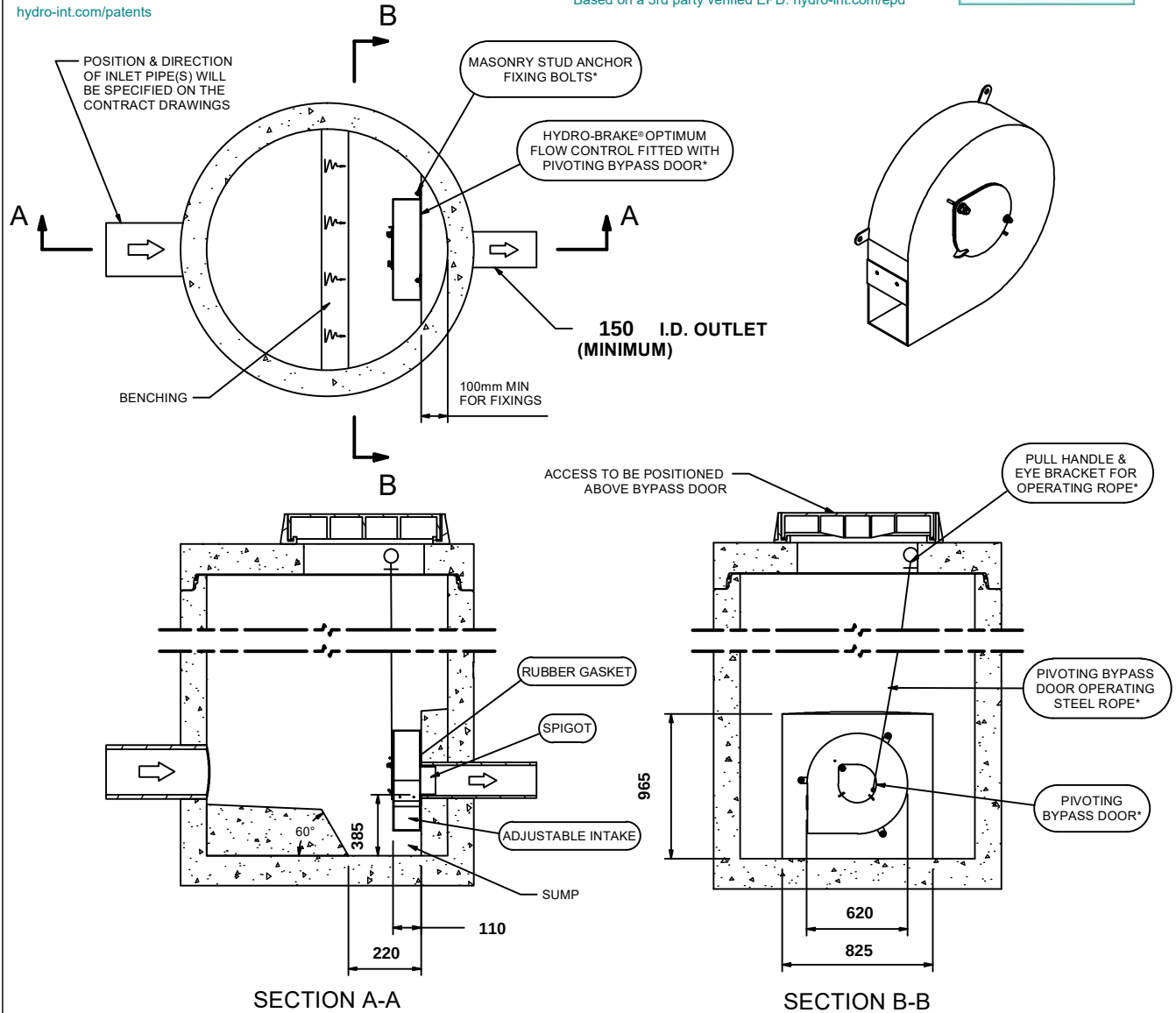
Control Point	Head (m)	Flow (l/s)
Primary Design	2.050	6.200
Flush-Flo™	0.441	5.334
Kick-Flo®	0.906	4.241
Mean Flow		4.986

hydro-int.com/patents

This Hydro-Brake® Optimum includes:

- All in 3 mm Grade 304L stainless steel
- Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- Media blasted for corrosion resistance
- Variable flow rate post installation via adjustable inlet (if necessary)
- Indicative Weight: 20 kg
- Product Carbon Footprint: 87.81 kgCO2e

Based on a 3rd party verified EPD: hydro-int.com/epd



IMPORTANT: LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® IS A REGISTERED TRADEMARK FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY
HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



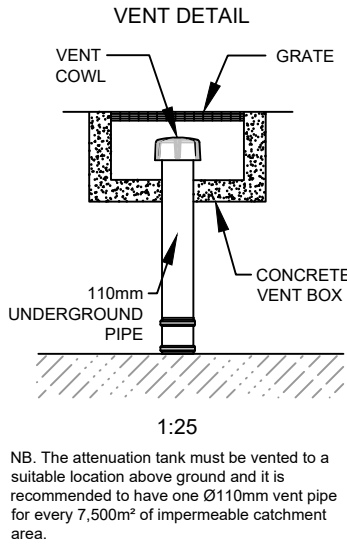
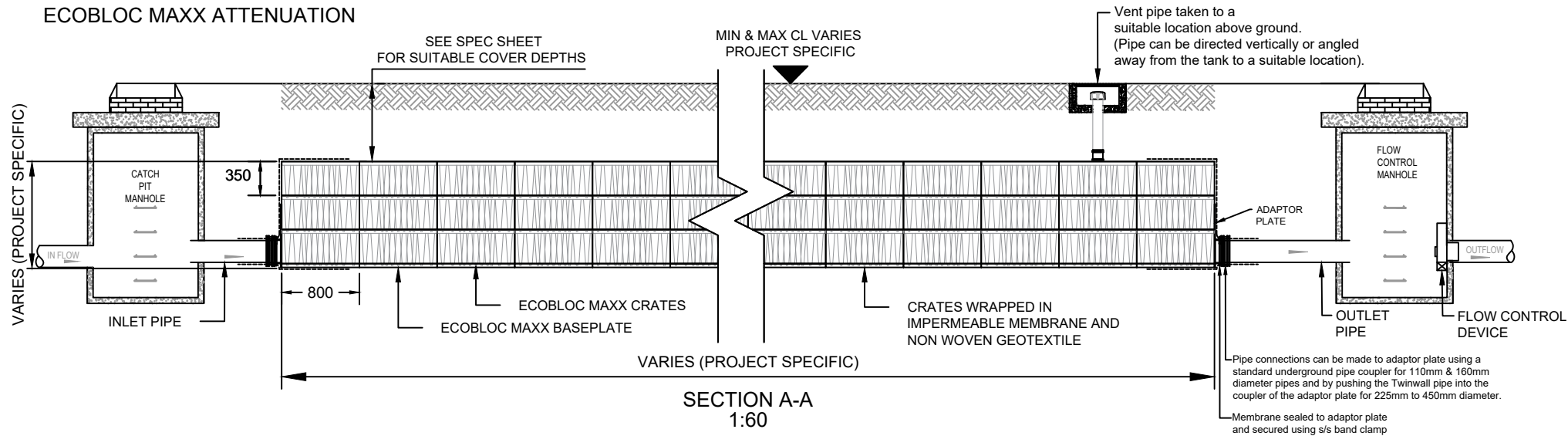
The head/flow characteristics of this SHE-0102-6200-2050-6200 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

**Hydro
International**
A CRH COMPANY

DATE	15/12/2025 11:26
SITE	Starwood House
DESIGNER	George Leafe
REF	40365

SHE-0102-6200-2050-6200
Hydro-Brake® Optimum

ECOBLOC MAXX ATTENUATION



THIS DOCUMENT IS SUPPLIED IN STRICT CONFIDENCE AND MUST NOT BE LENT, REPRODUCED OR DISCLOSED TO ANY THIRD PARTY WITHOUT THE WRITTEN CONSENT OF GRAF UK LIMITED

DO NOT SCALE - IF IN DOUBT ASK

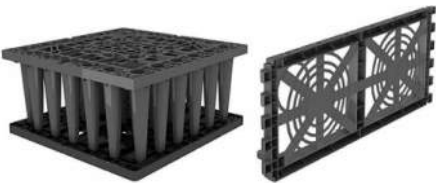
Notice: This drawing is issued only as a guideline and is an estimate of the materials required to construct the drainage system, it should not be used for construction purposes.

Graf UK Ltd makes no warranty or guarantee in relation to the suitability of any of the layout details shown on this drawing in relation to a particular scheme.

NOTES:-

1. All dimensions in mm, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing tolerances.
3. All site temporary enabling works by others.
4. Graf products to be installed in strict accordance with Graf recommendations.
5. This drawing is intended for guidance only. Confirmation of the suitability for a particular project should be sought from the consulting engineers prior to final design or commencement of any construction works.

ECOBLOC MAXX



	Crate	Baseplate
Dimensions (mm)	800 x 800 x 350	800 x 800 x 40
Gross Volume (m³)	0.225m³	0.025m³
Net Volume (m³)	0.217m³	0.020m³
Material	Polypropylene	Polypropylene
Weight	9kg	4kg
Void Ratio	>96% depending on number of layers	
Inspectable	Yes, when combined with EcoBloc Flex	
*UCS Vertical	365 kN/m²	
*UCS Lateral	99.6 kN/m²	

*Ultimate Compression Strength



P3	REVISED NOTES	AP	21.09.22
P2	LATEST REVISION	AP	15.03.21
REV.	DESCRIPTION	BY	DATE



GRAF UK Limited, Regen House, Beaumont Road, Banbury, Oxfordshire, OX16 1RH

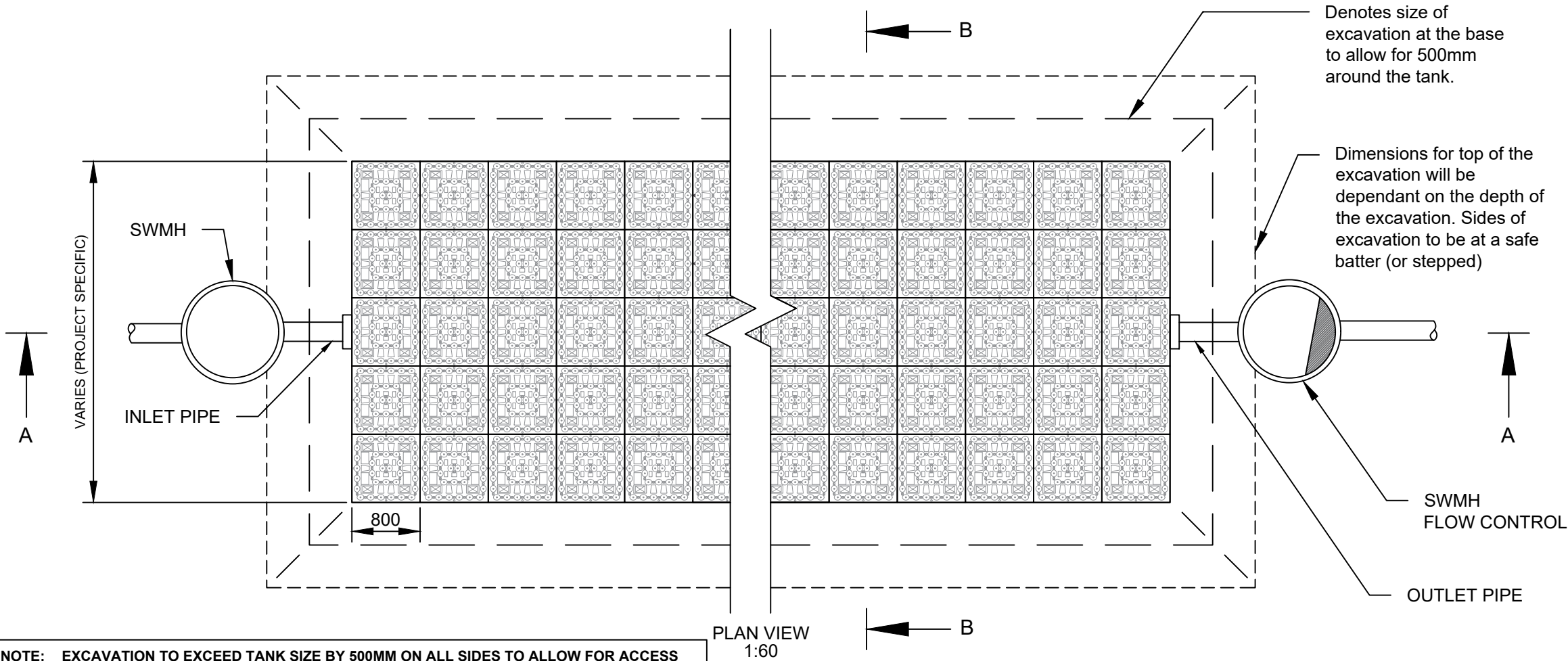
T: 01608 661500 F: 01295 211333
E: info@grafuk.co.uk www.grafuk.co.uk

DRAWN :	DB	DATE :	05.10.2018
CHECKED :	MC	SCALE :	VARIOUS@A3

PROJECT
GRAF STANDARD DETAILS

DESCRIPTION
ATTENUATION TANK
using GRAF ECOBLOC MAXX

DRAWING No.	REV.
STANDARD DETAIL.MAXX	P3 (Pg.1)



NOTE: EXCAVATION TO EXCEED TANK SIZE BY 500MM ON ALL SIDES TO ALLOW FOR ACCESS

BACKFILL UP TO FINISHED GROUND LEVEL USING SUITABLE MATERIAL AS REQUIRED FOR FINISHED COVER.

8 TO 16mm SINGLE SIZED NON-ANGULAR STONE AROUND SIDES OF TANK TO BE COMPLETED PRIOR TO ANY FILL MATERIAL BEING PLACED ON TOP OF TANK

ANGLE TO SUIT SAFE EXCAVATION OR SURROUNDING GROUND AND DEPTH

BASE LAYER TO BE 8 TO 16mm SINGLE SIZED NON-ANGULAR STONE MIN DEPTH 50mm

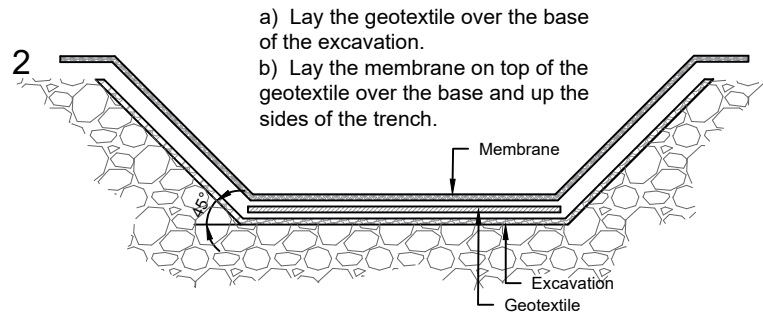
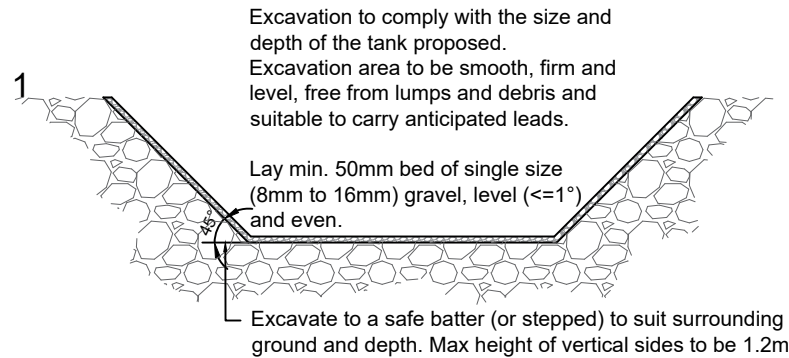
LAYER IMMEDIATELY ABOVE TANK TO BE 8 TO 16mm SINGLE SIZED NON-ANGULAR STONE MIN100mm BEFORE BACKFILLING AS PER FINISHED GROUND COVER

INNER LAYER TO BE 1MM THICK LLDPE IMPERMEABLE MEMBRANE (DENSITY = 0.939 g/cm³). SHEET WIDTHS OF 5.8M AND SUPPLIED IN ROLLS OR LENGTHS TO SUIT INSTALLATION. ALL JOINTS TO BE WEDGE WELDED TO FORM A WATERTIGHT SEAL.

OUTER LAYER TO BE 300g/m² (SNW40) NON-WOVEN GEOTEXTILE. INSTALLED WITH A MIN. OVERLAP OF 300mm

UNDISTURBED EARTH BASE OF EXCAVATION. EXCAVATED AREA TO BE SMOOTH, FIRM AND LEVEL, FREE FROM LUMPS AND DEBRIS AND SUITABLE TO CARRY ANTICIPATED LOADS WITH A MIN CBR VALUE OF 5%. SOFT SPOTS IN EXISTING MATERIAL BELOW BOTTOM OF EXCAVATION ARE TO BE DUG OUT AND THE RESULTANT VOIDS REPLACED WITH TYPE 1.

SECTION B-B
1:75



Geomembrane:
1mm Thick LLDPE Geomembrane
with a density of at least 0.939g/cm³

Geotextile:
300g/m² Non-woven,
needle punched geotextile

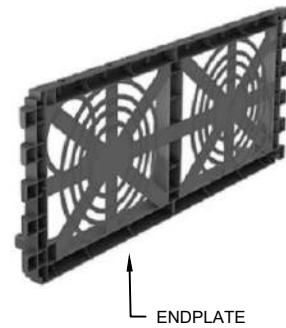
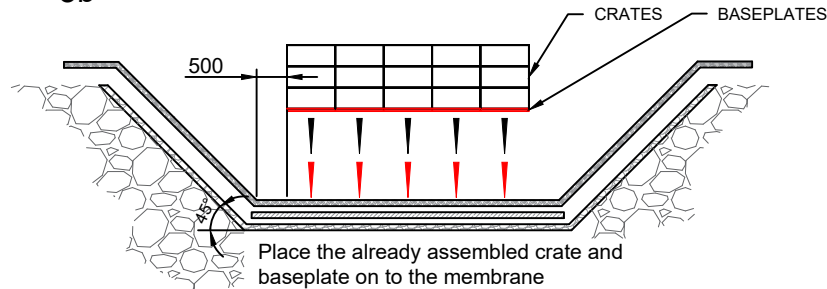
Geomembranes and Geotextiles with characteristics less than those specified are unlikely to be suitable and are therefore not recommended for use with Graf UK systems for this application

3a Assemble Baseplate and Ecobloc Maxx crate as shown below.

ECOBLOC MAXX CRATE

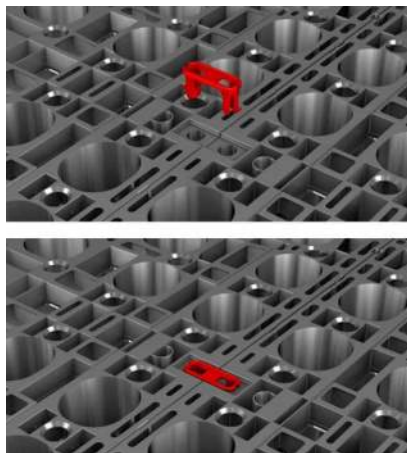


3b

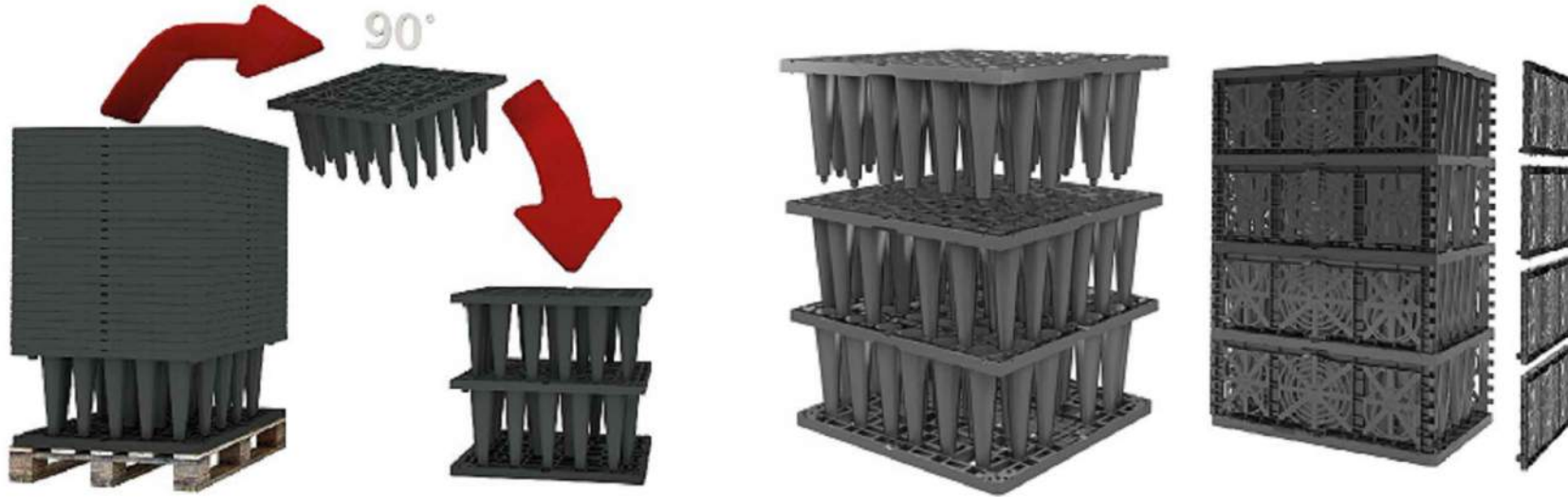


ENDPLATE

Remove a crate from the stack, rotate it 90° and place on top of the previously placed crate ensuring the connector clips are clipped locking the crates together.



Connector clips are Red for illustration purposes only and are Grey in colour



THIS DOCUMENT IS SUPPLIED IN STRICT CONFIDENCE AND MUST NOT BE LENT, REPRODUCED OR DISCLOSED TO ANY THIRD PARTY WITHOUT THE WRITTEN CONSENT OF GRAF UK LIMITED

DO NOT SCALE - IF IN DOUBT ASK

Notice: This drawing is issued only as a guideline and is an estimate of the materials required to construct the drainage system, it should not be used for construction purposes.

Graf UK Ltd makes no warranty or guarantee in relation to the suitability of any of the layout details shown on this drawing in relation to a particular scheme.

INSTALLATION METHOD:-

- a) Excavate the trench with a safe batter (or stepped) ensuring the footprint allows for sufficient space between tank and the sides. (minimum 500mm around all sides of the tank).
b) Mark out the position of the tank including inlets and outlets.
c) Lay min. 50mm of single sized non angular stone (8 to 16mm) as a base for the tank. This can be laid to a maximum fall of 1°.
- a) Lay the Geotextile over the base of the excavation, overlapping any joins by a minimum of 300mm
b) Lay the Membrane on top of the Geotextile over the base and up the sides of the trench.
c) Membrane must be joined by thermal fusion heated wedge welding. It is recommended that the Dual Seam method is used as this generates an unwelded channel which can be pressured with air to check the integrity of the weld.
d) The Membrane and Geotextile used must meet the specification stated on the drawing.
- a) Assemble EcoBloc Maxx Crate and Baseplate, position leg ends into corresponding holes in the Baseplate. The crate will only fit in the correct orientation. Push down firmly to ensure Crate is located correctly.
b) Install already assembled Crates and Baseplates onto the membrane until the first layer is complete. Insert retaining clips into each adjacent Crate.
c) To install the next layer of Crates remove from the stack and turn 90° and position directly above the Crate below. Push down firmly to ensure Crate is located correctly.
d) Continue until all Crates have been installed, ensuring clips are used to secure each Crate.
e) Fit Endplates to the sides of each Crate by positioning the bottom in place then pushing firmly on the top section to locate into place.
- a) Fix adaptor plates to the sides of the crates in the required position for the inlet and outlet pipes.
b) Cut a hole in the Geomembrane and pull up over the adaptor plate sealing the membrane around the spigot of the adaptor plate.
c) Pull Membrane up around the sides and fully wrap the crates, securing the lid in place by heated wedge welding to the side panels.
d) Cover the top and sides with Geotextile to protect the Geomembrane.
e) Install vent pipe connection into the top of the tank at a suitable location.
f) Backfill around the tank and for 100mm above with non-angular stone. Backfill to finished ground level with suitable material in layers.
g) Connect inlet/outlet pipes using appropriate bandseals.
h) In order to prevent silt from entering the tank it is recommended that silt traps or catchpit manholes are installed upstream of any inlet. These should be regularly maintained to avoid the buildup of any silt.

N.B. Installation method may vary depending on depth of the tank and is project specific. For more information or technical questions please contact our Technical Department at Graf UK.

P3	REVISED NOTES	AP	21.09.22
P2	LATEST REVISION	AP	15.03.21
REV.	DESCRIPTION	BY	DATE



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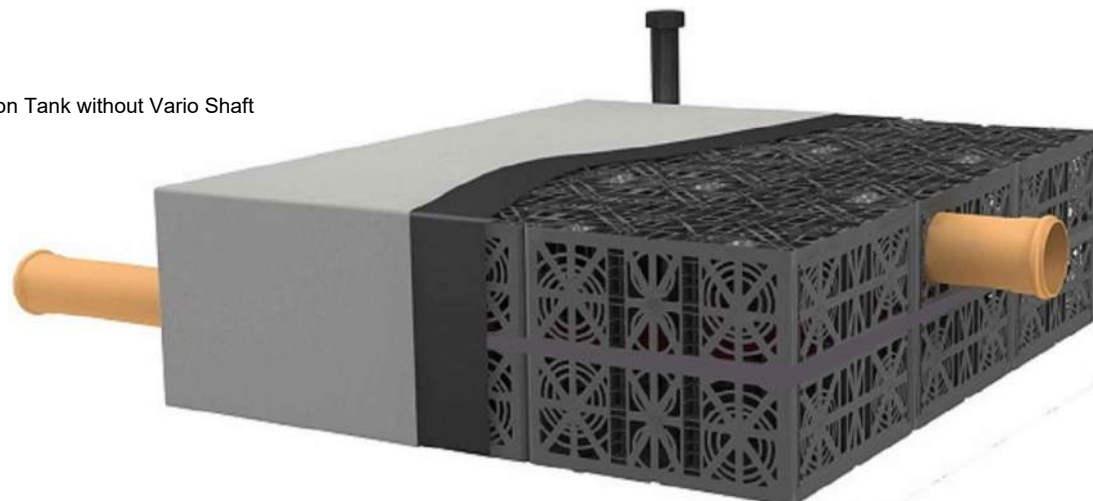
DRAWN : DB DATE : 05.10.2018
CHECKED : MC SCALE : VARIOUS@A3

PROJECT
GRAF STANDARD DETAILS

DESCRIPTION
**ATTENUATION TANK
using GRAF ECOBLOC MAXX**

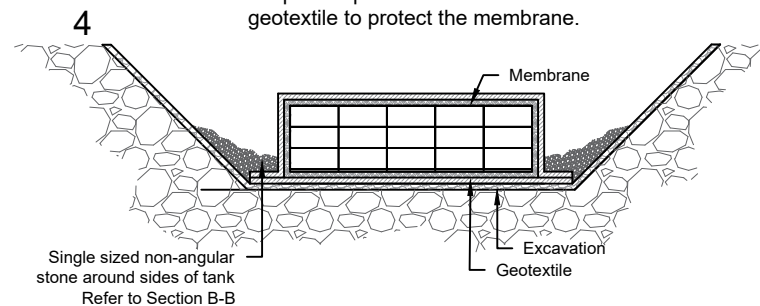
DRAWING No. **STANDARD DETAIL.MAXX** REV. **P3**
(Pg.2)

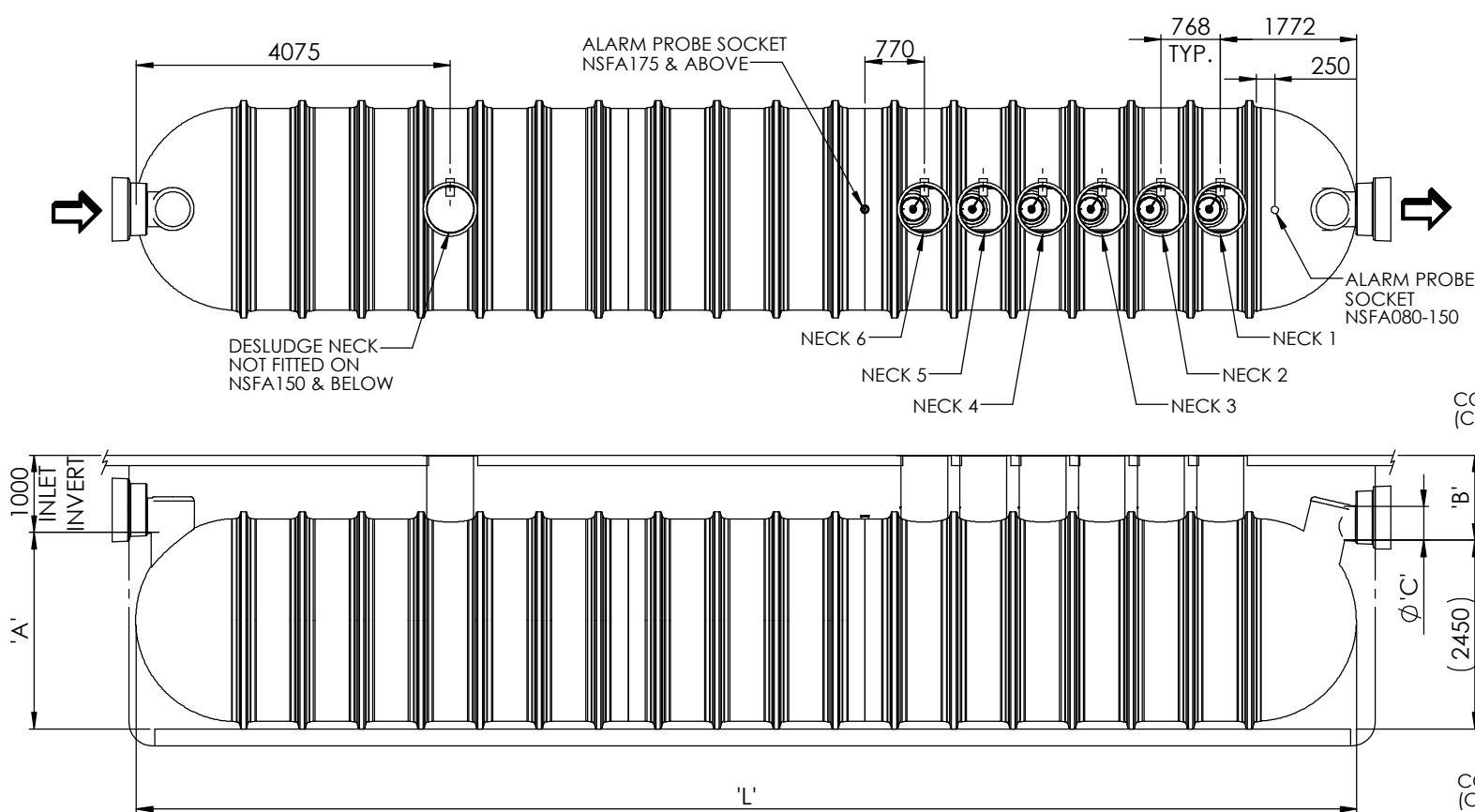
Attenuation Tank without Vario Shaft



Endplates are then clipped to the tank where required.

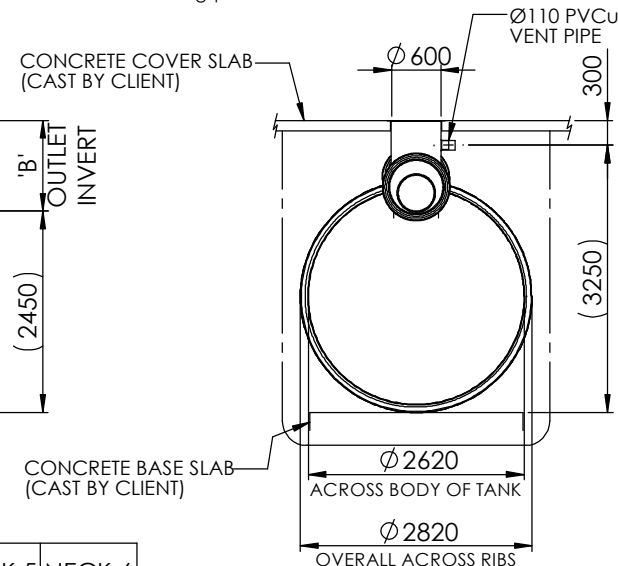
Wrap the crates with the Membrane ensuring it is heat welded/sealed then wrap the top and sides with the geotextile to protect the membrane.





NOTES

1. BS EN 858 STATES MINIMUM CONNECTION SIZES, UNITS ORDERED WITH DIFFERENT SIZE CONNECTIONS ARE NOT FULLY COMPLIANT WITH THE STANDARD. ALTERNATIVE CONNECTORS MAY BE ORDERED.
2. EXTENSION NECKS FOR DEEPER INVERTS CAN BE PROVIDED IN 0.5m INCREMENTS FOR ON SITE ASSEMBLY. MAX 2.0m INVERT RECOMMENDED.
3. ALL UNITS REQUIRE APPROPRIATE COVER & FRAME TO SUIT APPLIED LOADINGS.
4. THIS DRAWING SHOULD BE USED FOR DIMENSIONAL INFORMATION ONLY. IT IS ESSENTIAL THAT THIS DRAWING IS READ IN CONJUNCTION WITH INSTALLATION GUIDELINES SUPPLIED WITH THE UNIT (COPIES ARE AVAILABLE FROM OUR SALES DEPT.).
5. STANDARD PIPE ORIENTATION SHOWN. FOR OTHER AVAILABLE OPTIONS SEE TDS0033.
6. THIS DRAWING IS ALSO AVAILABLE ON OUR WEBSITE www.kingspanenv.com



UNIT REF.	UNIT CLASS	NOMINAL FLOW RATE (L/s)	APPROX. EMPTY WEIGHT (kg)	'L' OVERALL LENGTH	'A' BASE TO INLET INVERT	'B' OUTLET INVERT	'C' STD. PIPE DIA. (GRP)	NECK 1 FITTED	NECK 2 FITTED	NECK 3 FITTED	NECK 4 FITTED	NECK 5 FITTED	NECK 6 FITTED
NSFA080	1	80	1250	5744	2500	1050	300	✓	✓				
NSFA100	1	100	1350	6200	2500	1050	375/400	✓	✓				
NSFA125	1	125	1700	7365	2500	1050	450	✓	✓	✓			
NSFA150	1	150	2000	8675	2550	1100	500/525	✓	✓	✓			
NSFA175	1	175	2400	9975	2550	1100	500/525	✓	✓	✓	✓		
NSFA200	1	200	2700	11280	2550	1100	600	✓	✓	✓	✓		
NSFA210	1	210	2900	11994	2550	1100	600	✓	✓	✓	✓	✓	
NSFA225	1	225	3100	12766	2550	1100	600	✓	✓	✓	✓	✓	
NSFA240	1	240	3300	13582	2550	1100	600	✓	✓	✓	✓	✓	
NSFA255	1	255	3450	14300	2550	1100	600	✓	✓	✓	✓	✓	✓
NSFA270	1	270	3600	15071	2550	1100	600	✓	✓	✓	✓	✓	✓
NSFA285	1	285	3800	15833	2550	1100	600	✓	✓	✓	✓	✓	✓

Please check with Kingspan Environmental For The Latest Issue Of This Drawing			
Issue	Date	Drawn by	Description
04	11.03.19	T.Kelly	CC1444 - Units now built to 1.0m Invert First Fix
03	03.04.18	T.Kelly	CC1425 - Units 210 to 285 Added : Class 2 Reference Deleted

Material : n/a	Tolerance : n/a
Finish : n/a	Thickness : n/a
Weight : n/a	Surface Area : n/a

Drawing : DS0896P

Page 1 of 1

NSFA080 - NSFA285 Full Retention Separators

All dimensions in mm

Scale: Not to scale

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APPENDIX D – EXCEEDANCE FLOW PATH



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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

CONSTRUCTION

MAINTENANCE

DEMOLITION

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT

GENERAL NOTES

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL THE RELEVANT ARCHITECTS' ENGINEERS' AND SERVICE ENGINEERS DRAWINGS & SPECIFICATIONS.

2. BASED ON TERRAIN SURVEYS TOPO SURVEY TS25-T3-T1-3D AND CMP ARCHITECTS LAYOUT L060-CMP-SI-ZZ-DR-A-00100 - SITE PLAN.

LEGEND

SITE BOUNDARY

EXCEEDANCE FLOW ROUTE

P01	13.01.26	GL	Issued for Information	RM
REV	DATE	BY	DESCRIPTION	CHKD

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Berkhamsted, Herts SG4 8JZ
Tel: +44 (0)1462 508 602

CLIENT
Wrenbrigde

PROJECT
Letchworth, Ave One

DRAWING TITLE
EXCEEDANCE FLOW PATH

BSL PROJECT NUMBER 40365	DRAWING STATUS INFORMATION	OFFICE SOUTH
SCALE @ A0 1:250	DATE 13.01.2026	DRAWN BY GL
DRAWING No 40365-BGL-XX-XX-DR-C-00203	CHECKED BY RM	REV

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SCALE BAR 1:250