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AA Business Centre Suite 5 326-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JSJ

Drainage Strategy Report
Pilsworth ASDA Drive Thru Restaurant
Pilsworth Road, Bury, BL9 8RS
for
Euro Garages Ltd.

Revision	Date of issue	Comments	Prepared By	Checked By
0	09.09.2022	First Issue	RCTS	KTY



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1.0 Project Information Brief

Project	Pilsworth ASDA Drive Thru Restaurant
Project Location	Pilsworth Road, Bury, BL9 8RS
Client	Euro Garages Ltd
Project Status	Planning
Construction Value	TBC
Our Reference	22062798



2.0 Introduction

2.1 Background and Scope

The purpose of this report is to provide details on the design of both the surface water and foul drainage systems to support Euro Garages Ltd.'s planning application for the Drive Thru Restaurant development proposed at ASDA Pilsworth.

2.2 Site Description and Location

The site is an existing brownfield site located in southeast corner and car park of the wider ASDA superstore site in the Pilsworth Industrial Estate on Pilsworth Road, off the J3 exit of the M66 into Bury town. It is approx. 0.17ha in size.

The site is located by the postcode BL9 8RS and National Grid Reference E382044, N408923.



Figure 1: Site Location Plan (@Google Maps)

A copy of the site's topographical survey can be found in Appendix A.

3.0 Existing Site Drainage

The topographical survey of the site indicates the location of surface water manholes within the existing car park.



4.0 Proposed Site Drainage

4.1 Surface Water Drainage

As the existing site is a car park area, the total impermeable area will not change.

Currently, surface water discharge from the paved and hardstanding areas of the car park flows unattenuated into the existing onsite surface water system.

However, in accordance with the principles of sustainable drainage, the surface water drainage infrastructure for the new site layout has been designed to restrict discharge to a 30% betterment on the existing unattenuated discharge.

4.2 Hydraulic Design

A hydraulic design of the proposed site-specific surface water drainage network has been undertaken using Causeway Flow modelling package for all storm events up to and including the 100yr plus 30% climate change event.

The simulation of the network's performance has also been carried out with the restricted discharge rate of 16.9l/s (30% betterment of existing unattenuated site area). An attenuation storage of 25m³ has been provided for up to the 100yr rainfall event with 30% Climate Change.

Detailed calculations of the hydraulic modelling and simulation results can be found in Appendix C.

4.3 Operation and Maintenance Plan

The proposed surface water network for the drive-thru shall be maintained by the Euro Garage's own management company in accordance with the maintenance regime recommended in Table 1 below.

Table 1 SW System Operation and Maintenance

SuDS Feature	Operation and Maintenance
Cellular Attenuation Tank	Inspect twice in first year and after major storm events, desilt as required. Tank to be 'accessible' type with inspection chambers for maintenance.
Hydrobrake	The Hydro-brake has no moving parts and no power requirements and provides reliable, low-maintenance, engineered flood management. Periodic desilting of the Hydrobrake sump as well as checking the emergency drain down mechanism is in good working order. The sump should be emptied/checked at least as follows (but with an annual inspection and additional cleansing if required): On completion of drainage works, Year 1, Year 3, then every 5 years.

Silt Trap	Inspect six-monthly, empty every 12 months and after every major storm or local flood event
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4.4 Foul Drainage

It is proposed to utilise a separate standard gravity pipe system for draining foul water to discharge into the foul network of the existing ASDA store.

Design discharge rates are based upon typical rates observed for Euro Garages sites.



5.0 Drawings and Calculations

Drainage Strategy and External Levels

SD-300 Standard Details – Surfaces

SD-302 Standard Details – Drainage

SD-303 Standard Details – Manholes

SD-304 Standard Details – Attenuation Tanks

Hydraulic Model Calculation (FLOW)

SW Discharge Assessment



Appendix A

Topographical Survey



Appendix B

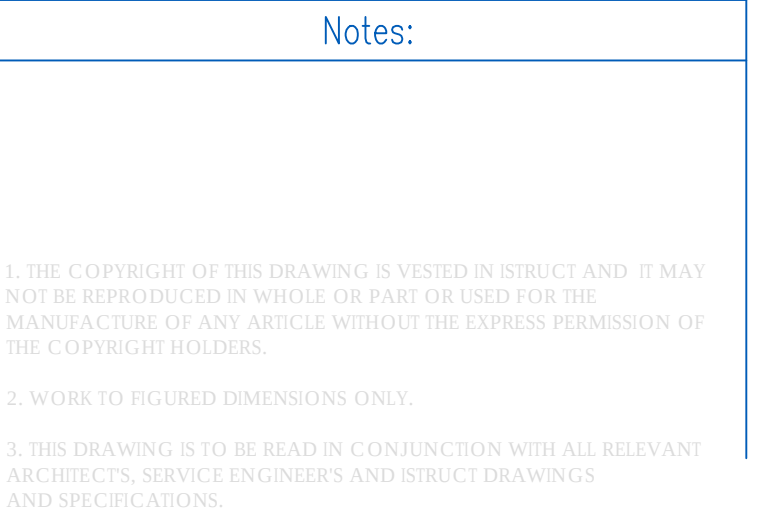
Drawings



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	PROPOSED PRIVATE SURFACE WATER MANHOLE (>3 CONNECTIONS)
	PROPOSED PRIVATE SURFACE WATER INSPECTION CHAMBER (MAX 3 CONNECTIONS)
	PROPOSED PRIVATE SURFACE WATER BACKDROP
	PROPOSED PRIVATE RODDING EYE
	PROPOSED PRIVATE METAL GULLY
	PROPOSED PRIVATE LAND DRAIN
	PROPOSED CHANNEL DRAIN. ACO OR SIMILAR APPROVED. REFER TO MANUFACTURER'S DETAILS FOR INSTALLATION AND GUIDANCE.
	CELLULAR STORAGE
	PROPOSED PRIVATE FOUL WATER MANHOLE (>3 CONNECTIONS)
	PROPOSED PRIVATE FOUL WATER INSPECTION CHAMBER (MAX 3 CONNECTIONS)
	PROPOSED PRIVATE FOUL WATER ACCESS CHAMBER
	PROPOSED PRIVATE FOUL WATER BACKDROP
	SITE BOUNDARY
	FINISHED FLOOR LEVEL
	FINISHED EXTERNAL LEVEL



- NOTES:
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE OTHER RELEVANT ENGINEERS AND ARCHITECT'S DETAILS
 2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT BRITISH STANDARDS AND THE RELEVANT LOCAL BUILDING REGULATIONS AND WITH SEWERS FOR ADOPTING 6TH EDITION GUIDANCE
 3. THE PROPOSED PIPE LEVEL, SIZE AND USE OF EXISTING SEWERS TO BE CONFIRMED ON SITE. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO COMMENCEMENT OF WORKS
 4. UNCOVERED AND SHALLOW PIPEWORK TO BE PROTECTED AGAINST CONSTRUCTION TRAFFIC AS PART OF THE CONTRACTORS TEMPORARY WORKS REQUIREMENTS
 5. THE DRAWING SHOWS A RECOMMENDED CONNECTION TO THE ARCHITECT'S EXTERNAL WORKS AND LANDSCAPING SCHEME
 6. CONNECTIONS TO FOUL TERMINAL FITTINGS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF ABOVE GROUND PIPE DIAMETERS AND / OR DESIGN FLOW. NO WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW
 7. ALL PIPEWORK ENTERING AND EXITING MANHOLES TO BE CONFORMED WITH PIPE SPECIFICATIONS
 8. PRE-FORMED CHANNELS TO BE USED AT ALL MANHOLES
 9. HIGH STRENGTH CONCRETE BENCHING TO BE STEEL
 10. FLOWELED TO A DRAINAGE POINT, FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS AND LAID IN ACCORDANCE WITH THE SPECIFICATION
 11. ALL PRE-CAST CONCRETE MANHOLE COVERS TO BE PROVIDED
 12. ALL MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON HEAVY DUTY GRADE D400 DOUBLE TRIANGULAR TO BS EN 124 (24) OR OTHER EQUIVALENT. ALL COVERS TO BE LABELED 'W' AND 'SW' AS APPROPRIATE
 13. GULLY TOPS AND MANHOLE COVERS TO BE PROVIDED IN ACCORDANCE WITH BS EN 122
 14. ALL MANHOLE COVERS LOCATED INTERNALLY, TO BE RECESSED, DOUBLE SEAL, AIRTIGHT TYPE, ALUMINIUM OR STEEL, RECESS DEPTH TO ARCHITECT'S REQUIREMENTS TO SUIT CURBS, ETC
 15. ALL NEW DRAINAGE TO BE CONSTRUCTED ADJACENT NEW AND PROPOSED TREE PLANTING TO BE PROTECTED AGAINST ROOTS BY USING ROOT BARRIERS
 16. ALL MATERIAL BY GREEN-TECH, LTD. IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
 17. FIRST LEG TO JOINT IN PROXIMITY TO A MANHOLE SHALL BE 600MM MAX. FROM INSIDE FACE OF MANHOLE, CONNECTING TO ROCKER PIPE. FOR PIPE DIAMETERS 150MM - 450MM THE ROCKER PIPE SHALL BE 675MM. FOR 450MM AND FOR PIPE DIAMETERS 451MM - 675MM THE ROCKER PIPE LENGTH SHALL BE 750MM - 1000MM.
 18. ALL MANHOLES WITH OUTSIDE PIPE DIAMETERS GREATER THAN 600MM DIA. SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER APPROVED SAFETY DEVICES
 19. WHERE THE FORMATION OF THE SUBGRADE IS ABOVE ORIGINAL GROUND LEVEL, LEVELS ARE TO BE MADE UP WITH COMPACTED DPT TYPE 2 MATERIAL OR BETTER
 20. ALL EXISTING CONCRETE OR MASONRY MANHOLE ROADS & SULPHATES CONDITIONS IN ACCORDANCE WITH TABLE 1 OF BRE DIGNEST 363
 21. CONCRETE PROTECTION SHALL BE PROVIDED TO ALL PIPES WITH LESS THAN 300MM COVER IN PEDESTRIAN AREAS, TO ALL PIPES WITH LESS THAN 600MM COVER IN PRIVATE DRIVEWAYS NOT USED BY COMMERCIAL VEHICLES, AND TO ALL PIPES WITH LESS THAN 900MM COVER IN PRIVATE ROADS & PRIVATE DRIVEWAYS USED BY COMMERCIAL VEHICLES, WHERE CONCRETE SURROUND IS SPECIFIED FLEXIBILITY OF JOINTS TO BE MAINTAINED TO A MINIMUM OF 100MM BETWEEN IMPREGNATED FIREBOARD AT EACH POINT.

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REV:	DESCRIPTION:	BY:	DATE:
STATUS: FOR_COSTING_ONLY			

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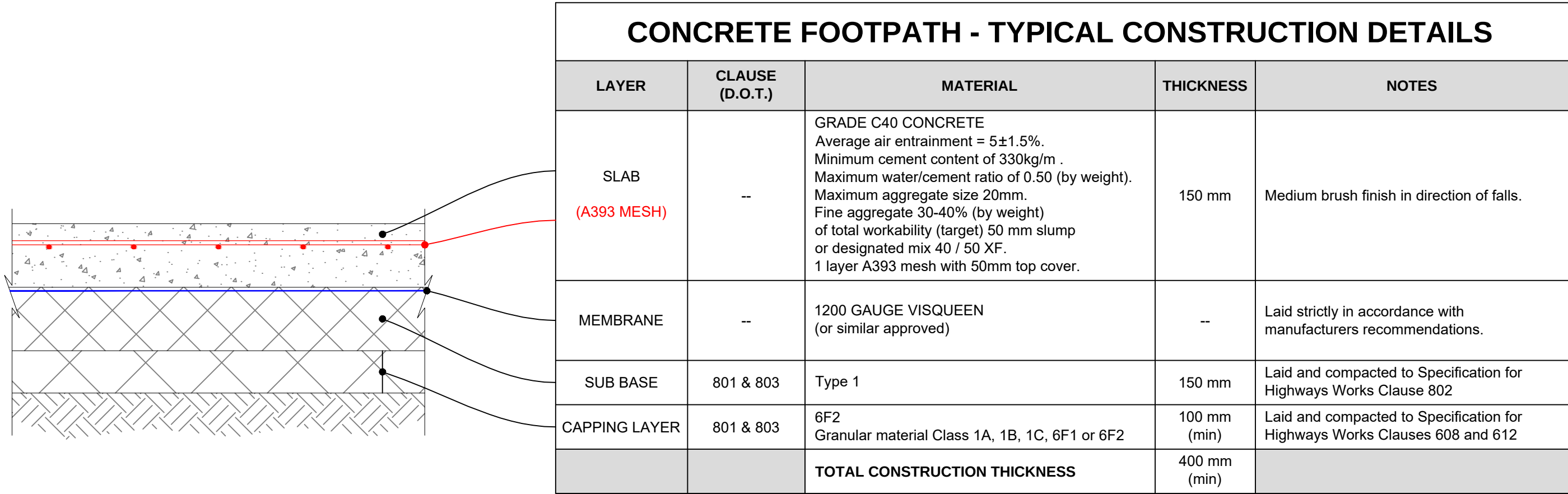
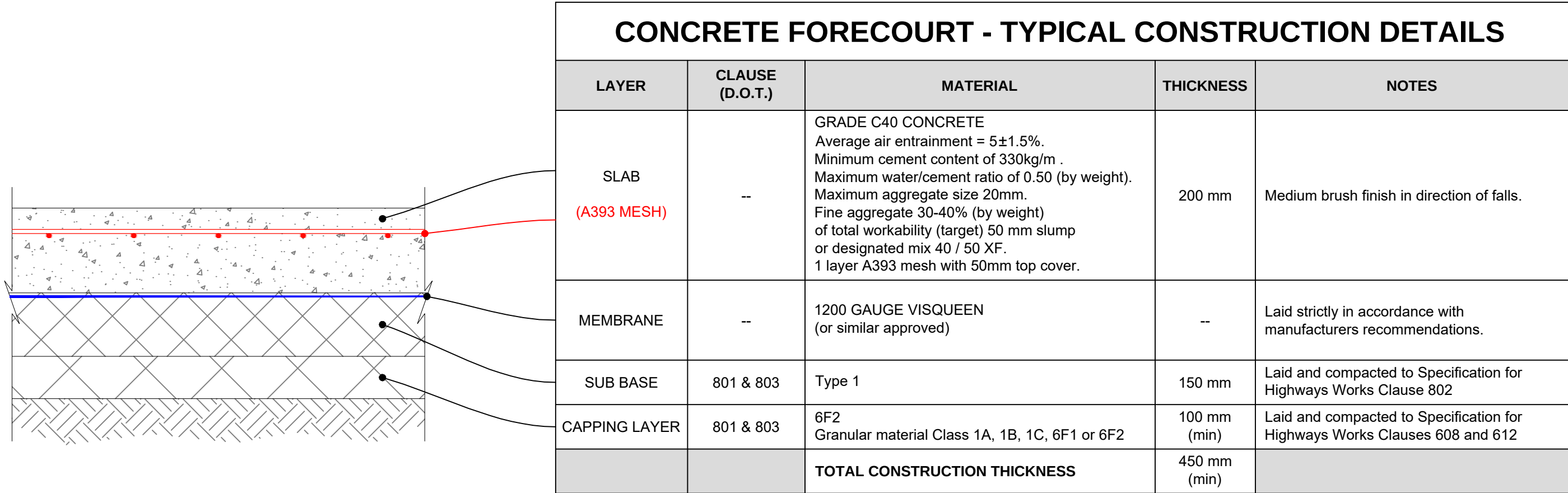
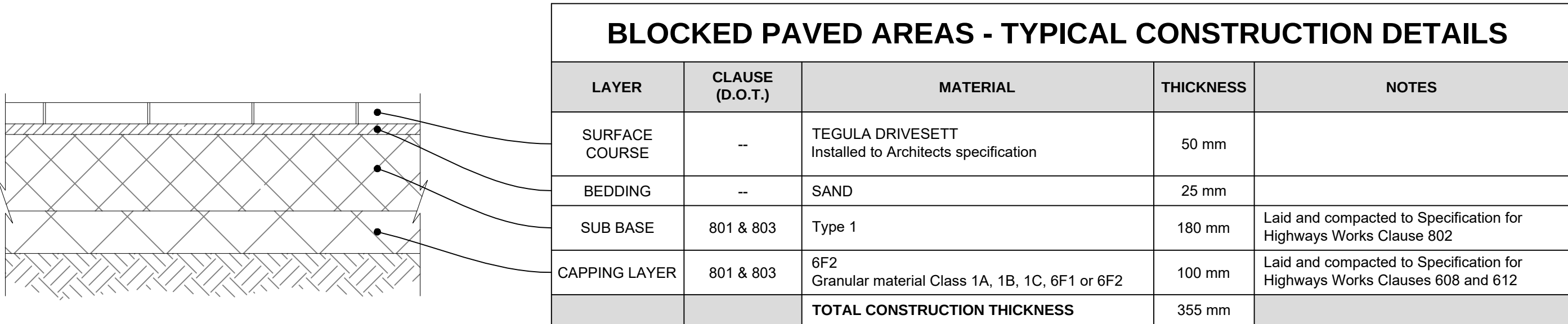
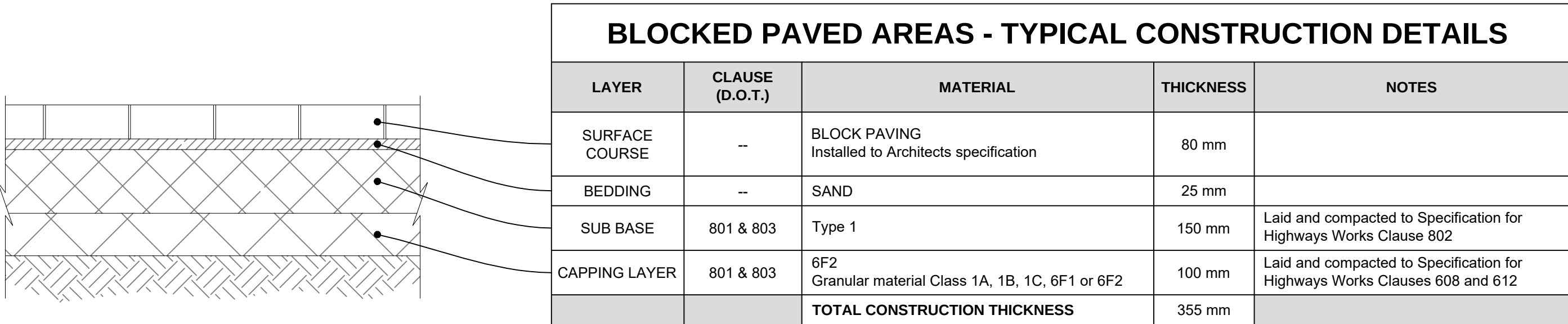
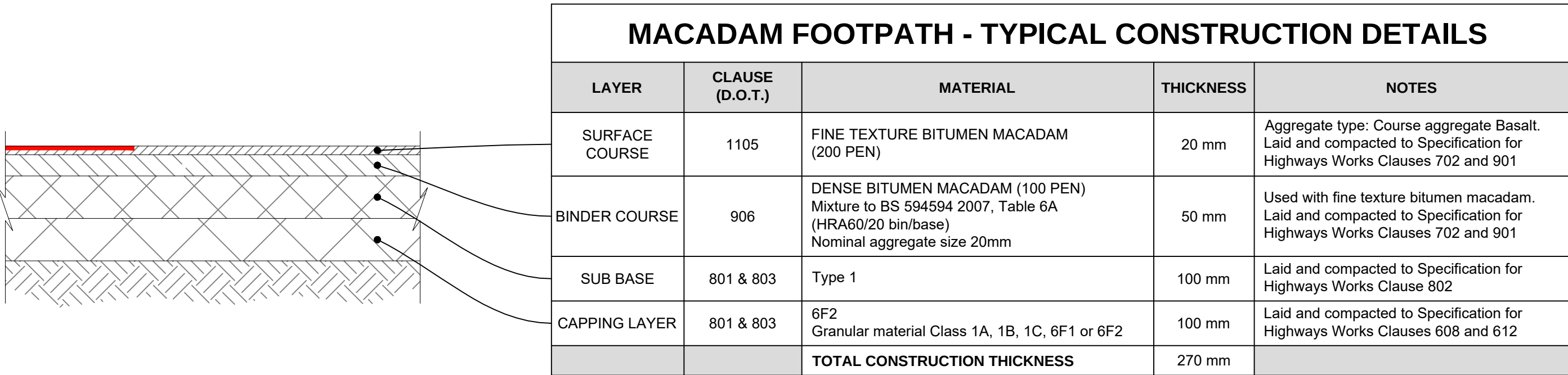
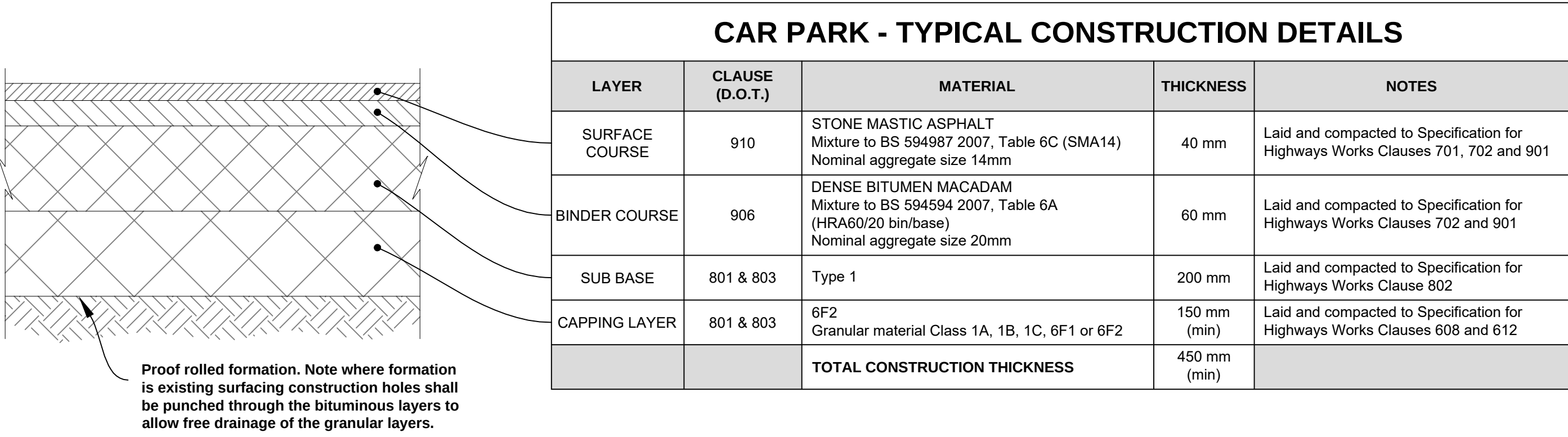
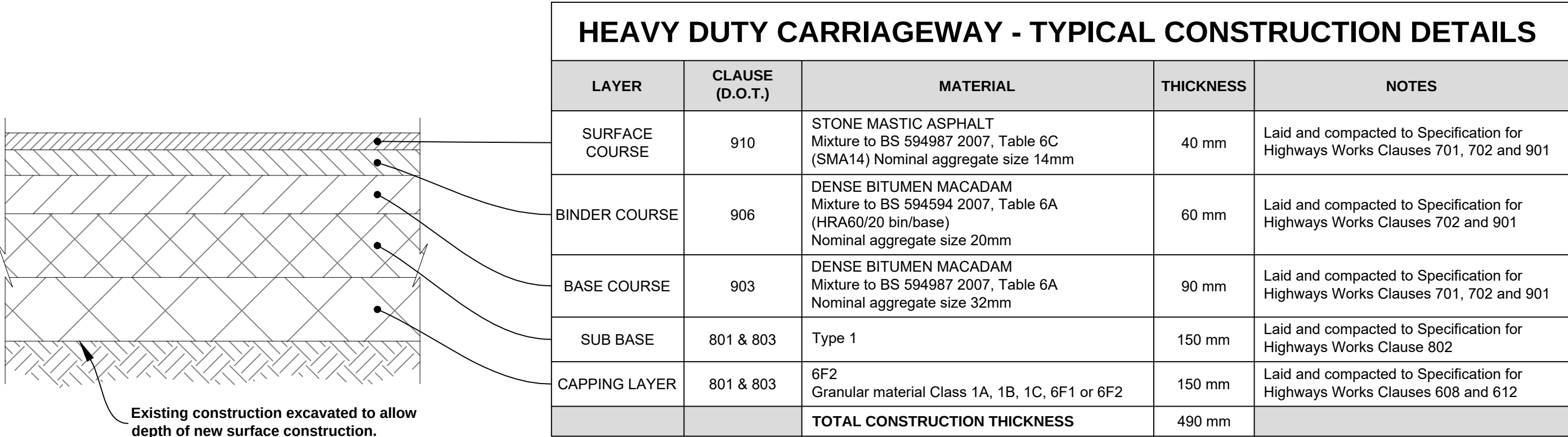
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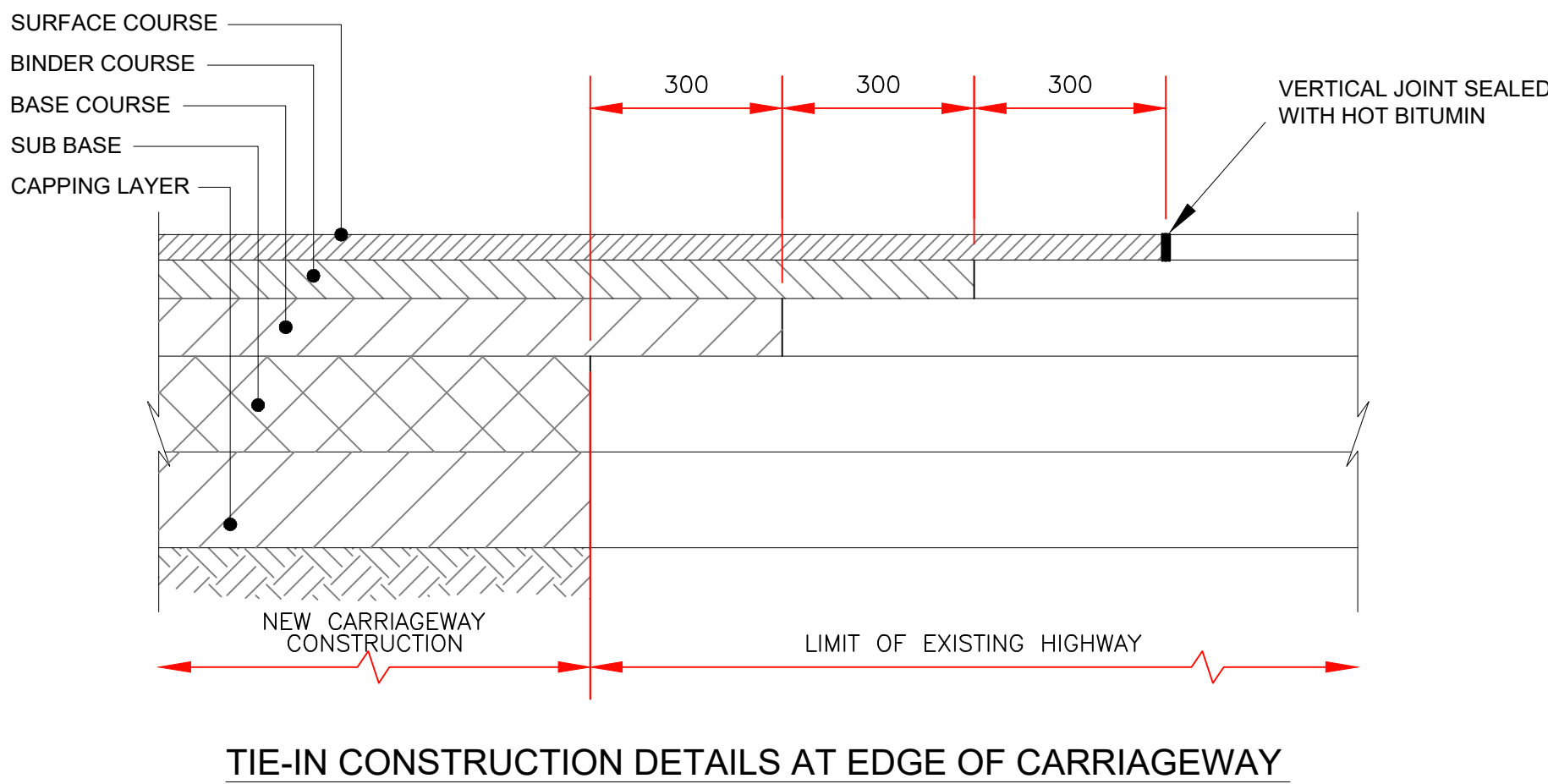
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PILSWORTH ROAD, BL9 8RS			
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AND EXTERNAL LEVELS			
SCALE: AT 1:100	DATE: SEPT 2022	DRAWN: RDL	CHECKED: KTY
PROJECT NO: 22062798	DRAWING NO: 100	REVISION: P1	

CDM HAZARDS		
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement. In additions to the Hazards/ Risks normally associated with the types of works detailed on the drawing, note the following:		
Ref.	Activity	Hazard
3	Working adjacent to existing buildings	Danger of collapse during construction phase - Experienced personnel only working to approved RAMS
4	Temporary propping + stability of structure during works	The Contractor is responsible for maintaining the stability of the building with the design of all temporary works
5	Delivery and erection of steelwork	Danger of collapse during erection - Experienced personnel only working to approved RAMS
6	Working at height	Danger of falling from height - Experienced personnel only working to approved RAMS



NOTE:
CBR of 2% to be assumed for all road construction thicknesses unless ground testing determines otherwise.

FOUNDATION THICKNESS		
CBR %	GRANULAR SUB BASE - TYPE 1	CAPPING LAYER
>2	150	600
2	150	450
2.5	350	0
2.5	150	400
3	300	0
3	150	350
4	250	0
4	150	300
5	150	250
5	225	0
8	150	20
8	190	0
>15	150	



P1

Standard Issue

YA

04/22

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PROJECT:

Proposed Development

TITLE:

Standard Details
Surface Construction

SCALE: AT A1:

DATE:

DRAWN:

CHECKED:

As Shown

APR_2022

YA

MM

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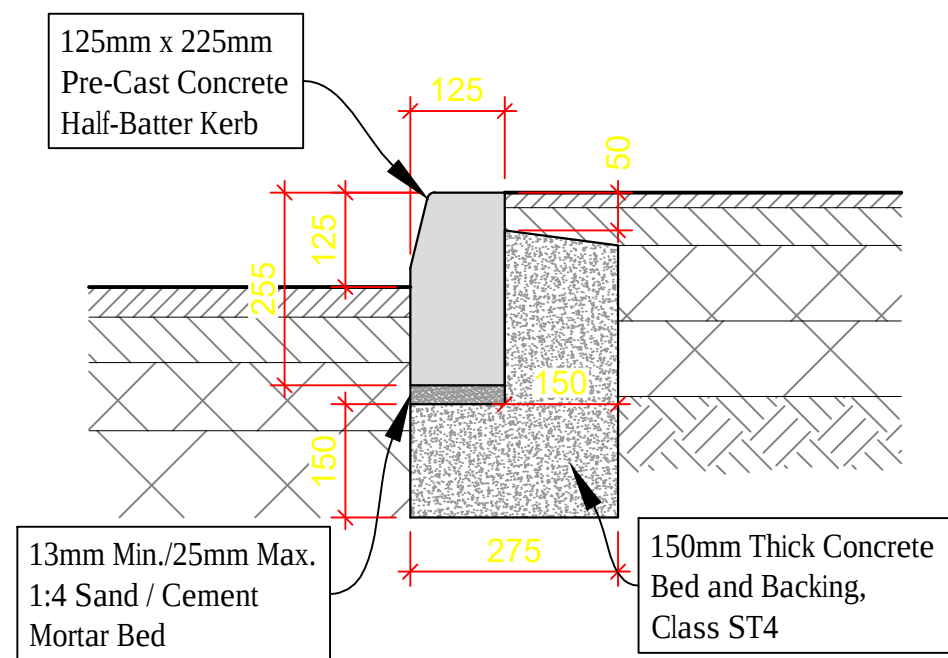
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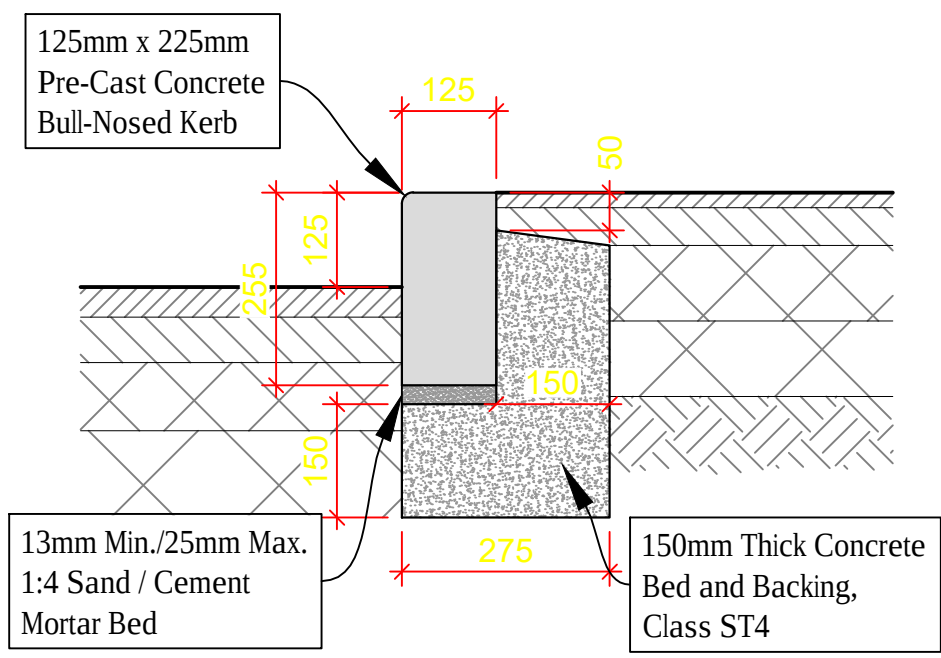
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SD-300

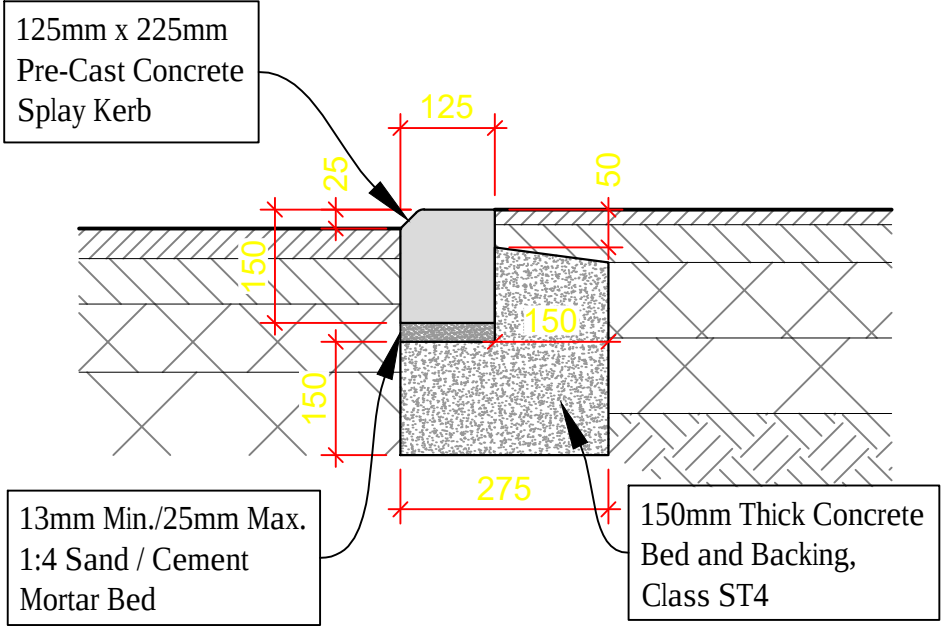
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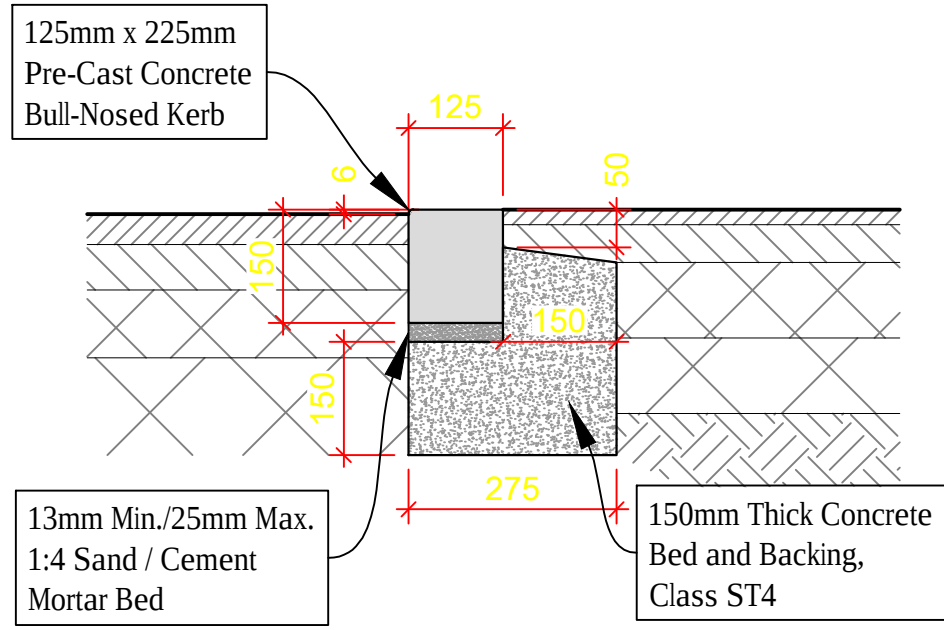
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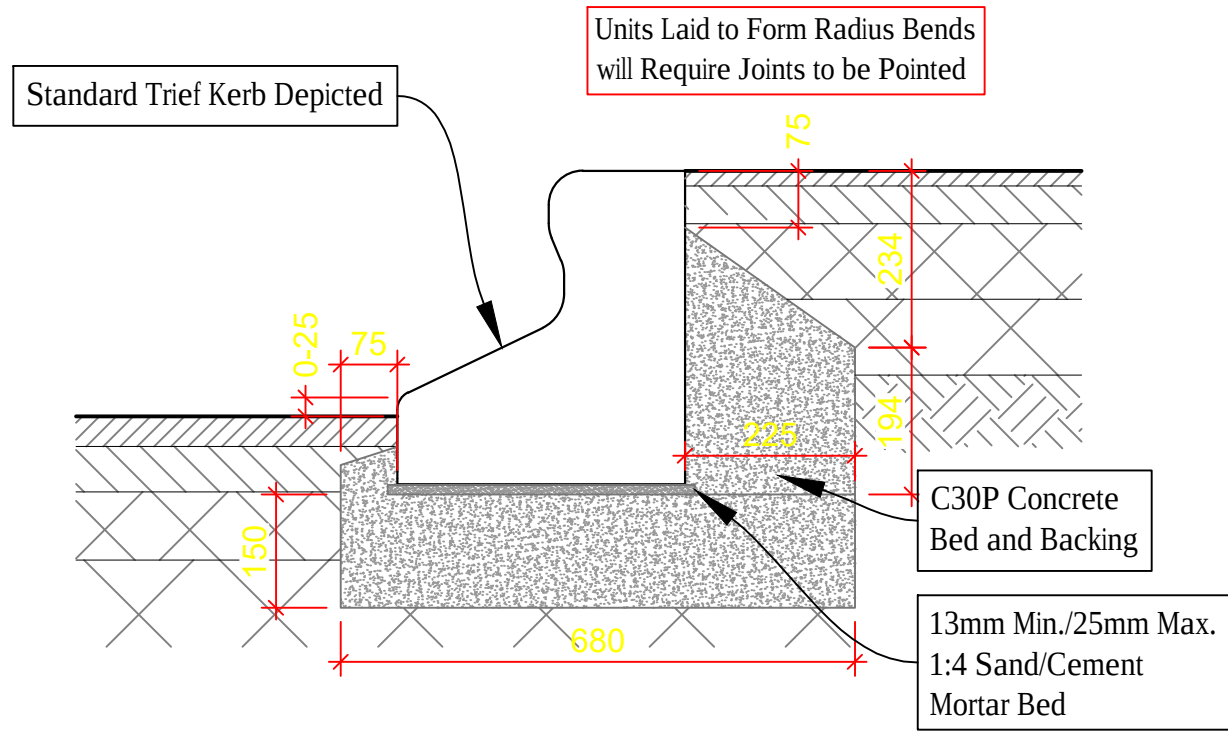
BULL-NOSE KERB - TYPICAL DETAIL



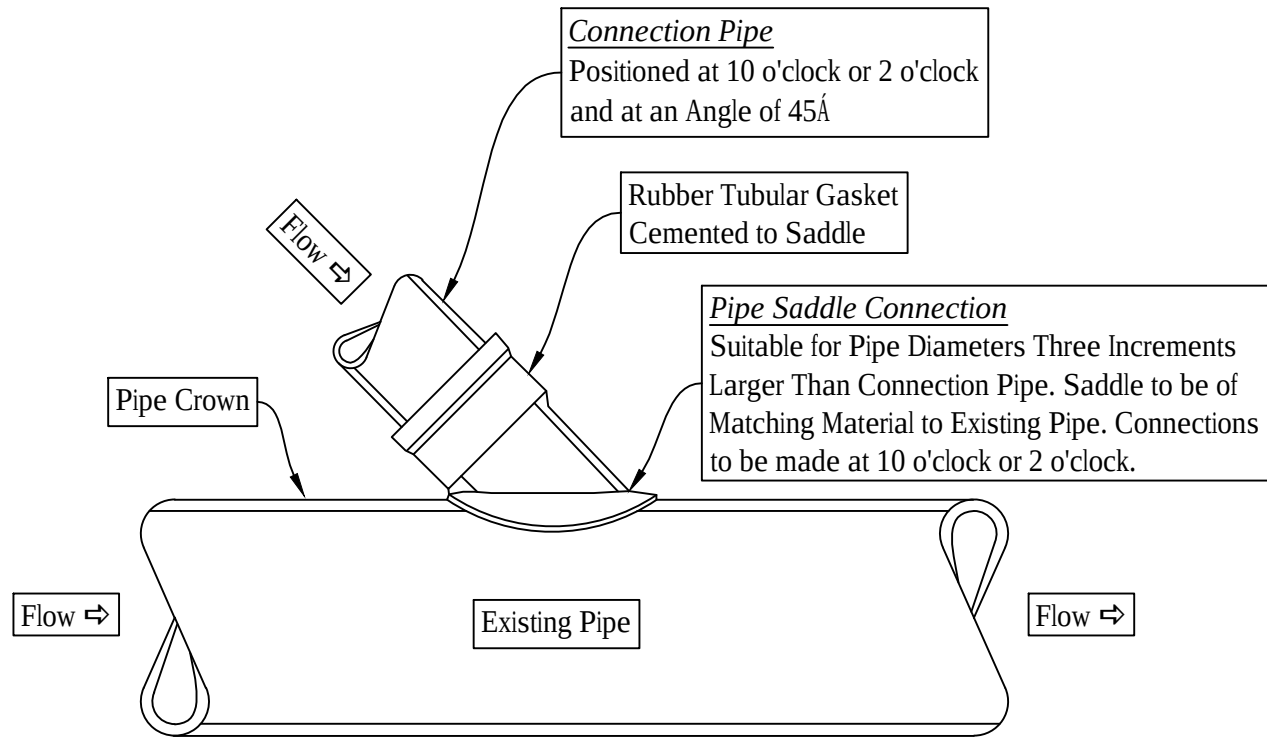
DROPPED KERB - TYPICAL DETAIL



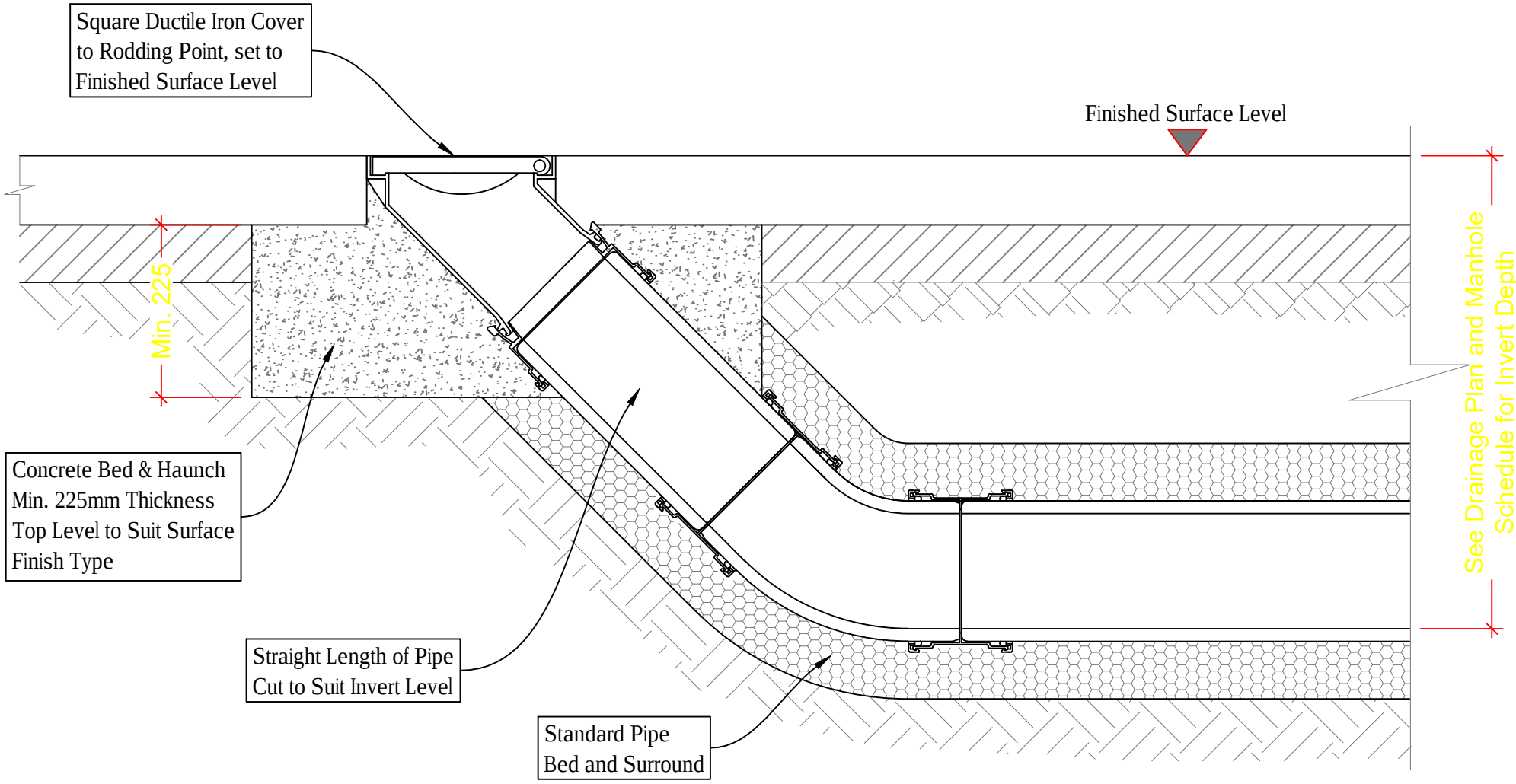
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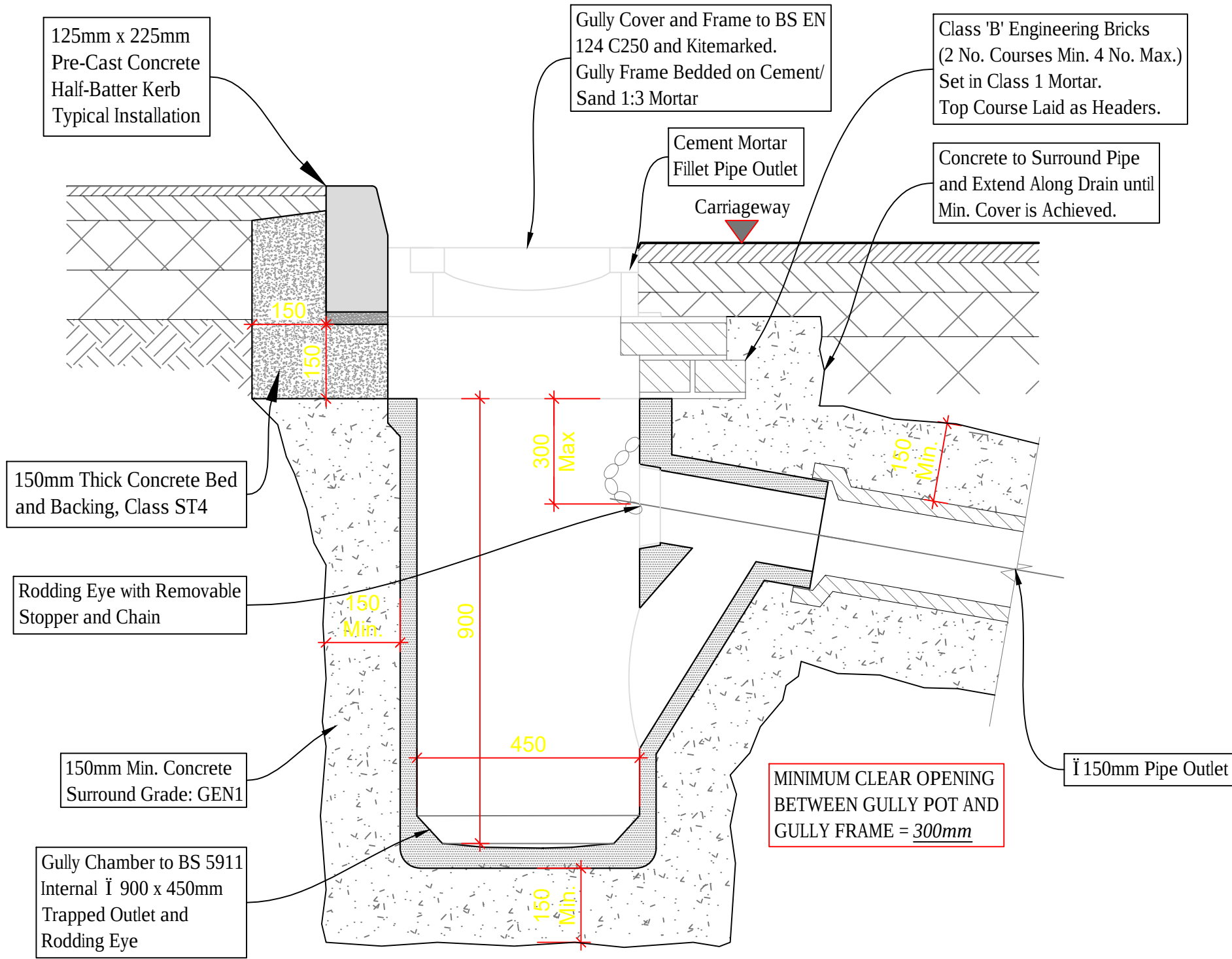
SAFETY KERB - TYPICAL DETAIL



SADDLE CONNECTION - TYPICAL DETAIL

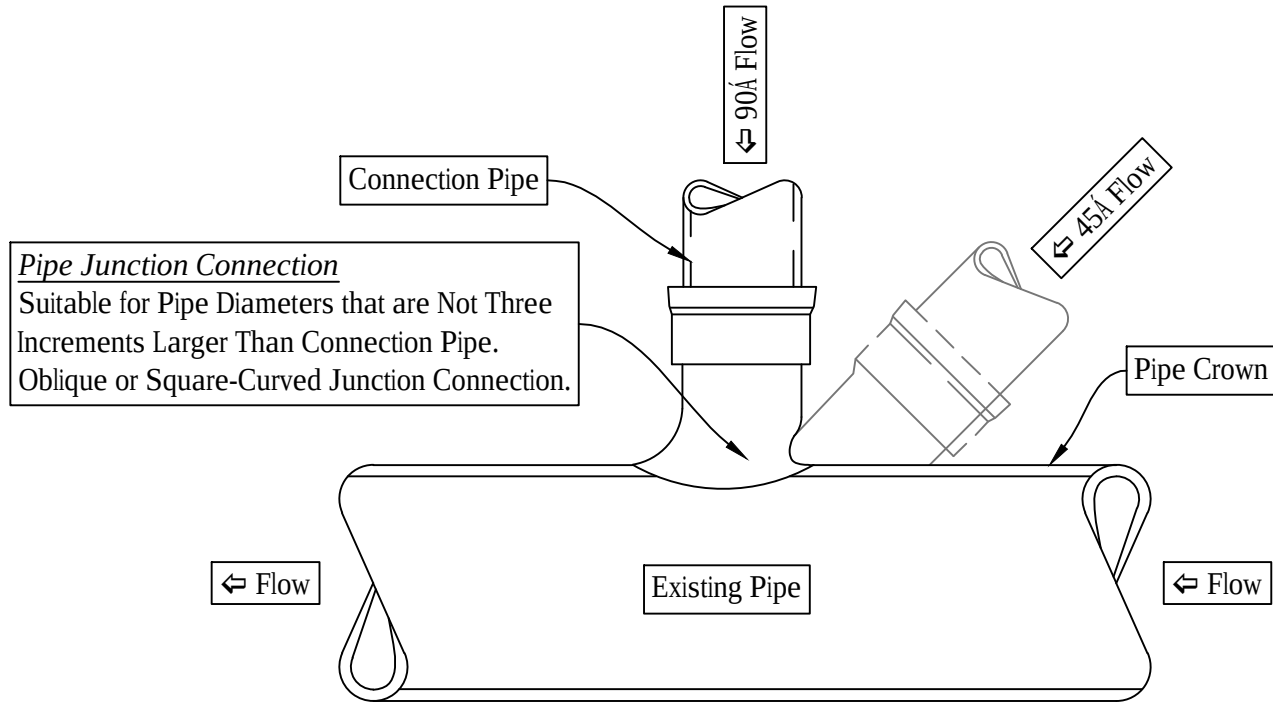


RODDING EYE - TYPICAL DETAIL

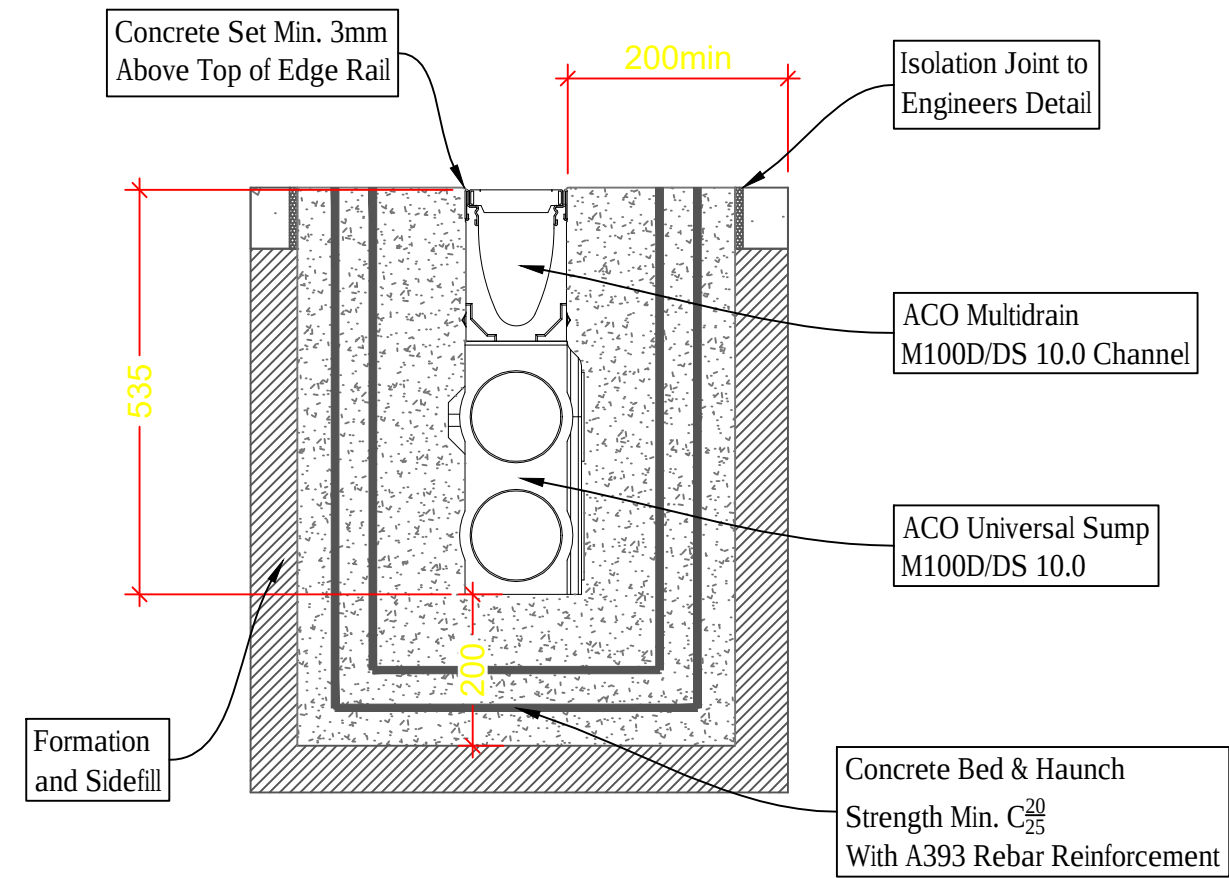


DRAINAGE GULLY - TYPICAL DETAIL

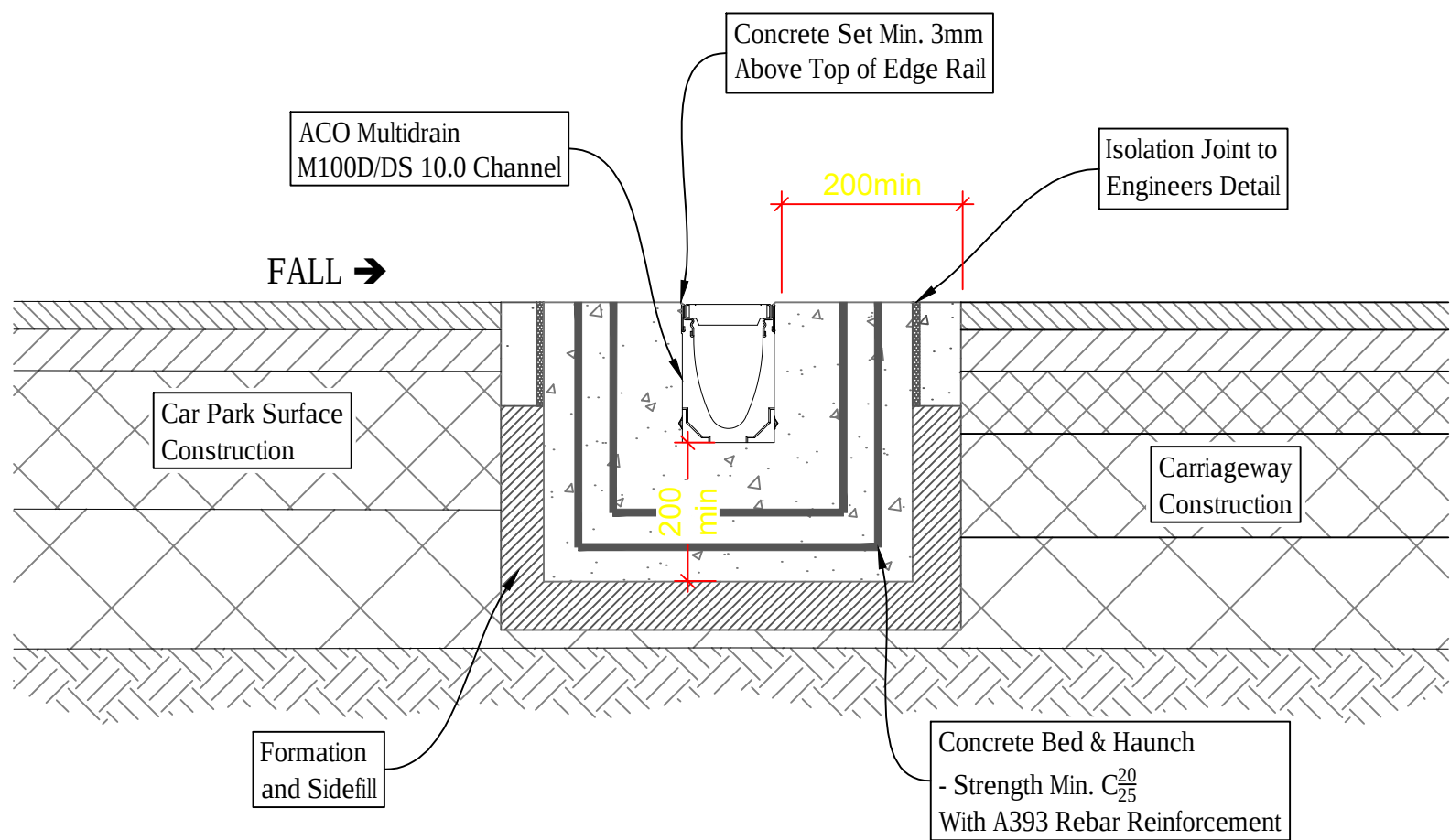
		EXISTING CONNECTION DIAMETER									
		100	150	225	300	375	450	525	600	675	750
PROPOSED CONNECTION Ø	100	Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	150		Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	225			Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	300				Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.
	375					Jun.	Jun.	Jun.	Sad.	Sad.	Sad.
	450						Jun.	Jun.	Jun.	Sad.	Sad.



JUNCTION CONNECTION - TYPICAL DETAIL



CHANNEL DRAIN SUMP - TYPICAL DETAIL



CHANNEL DRAIN - TYPICAL DETAIL

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STATUS: PLANNING			

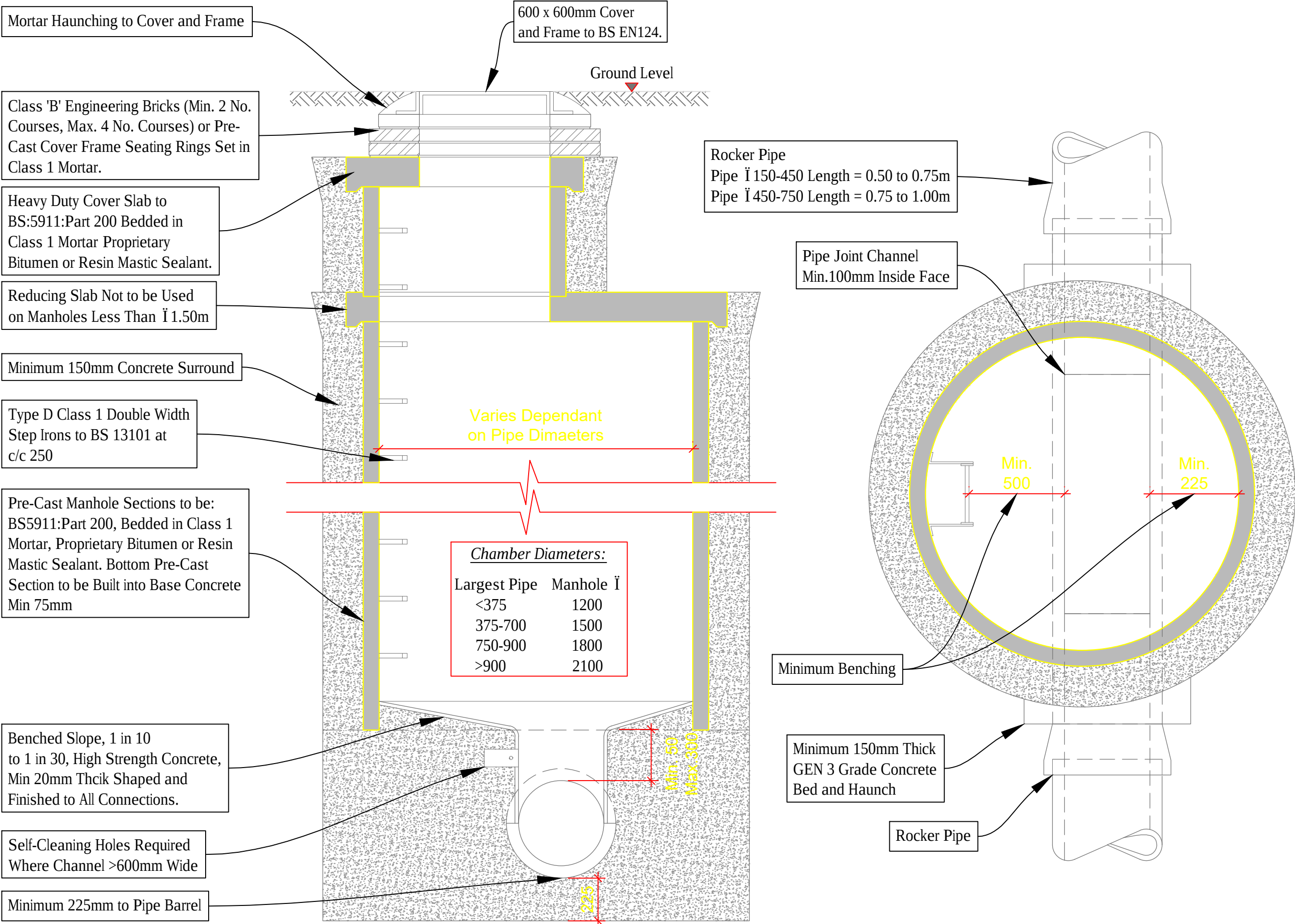
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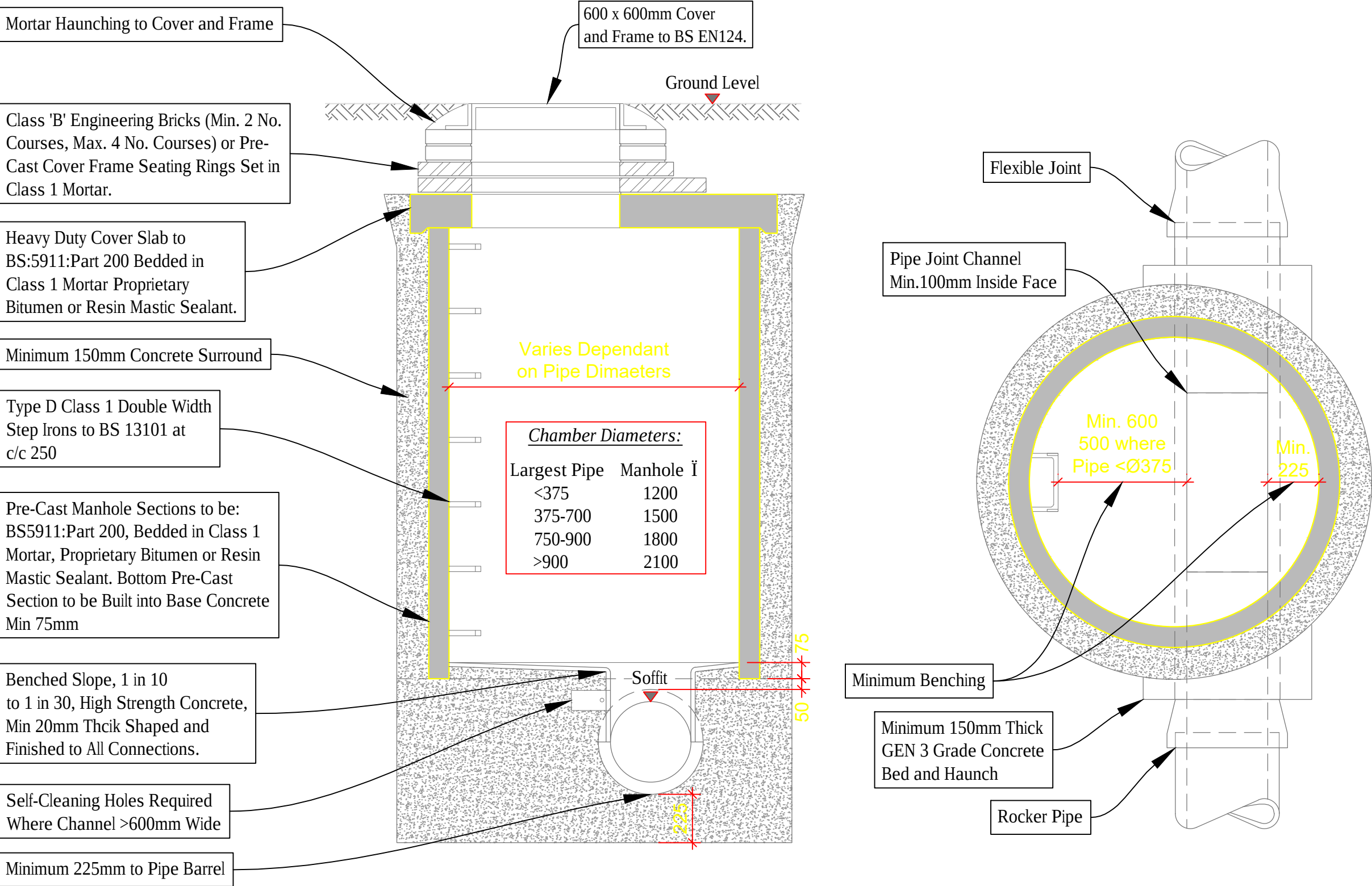
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EG
Euro Garages

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PROJECT NO: -	DRAWING NO: SD-302	REVISION: P1	

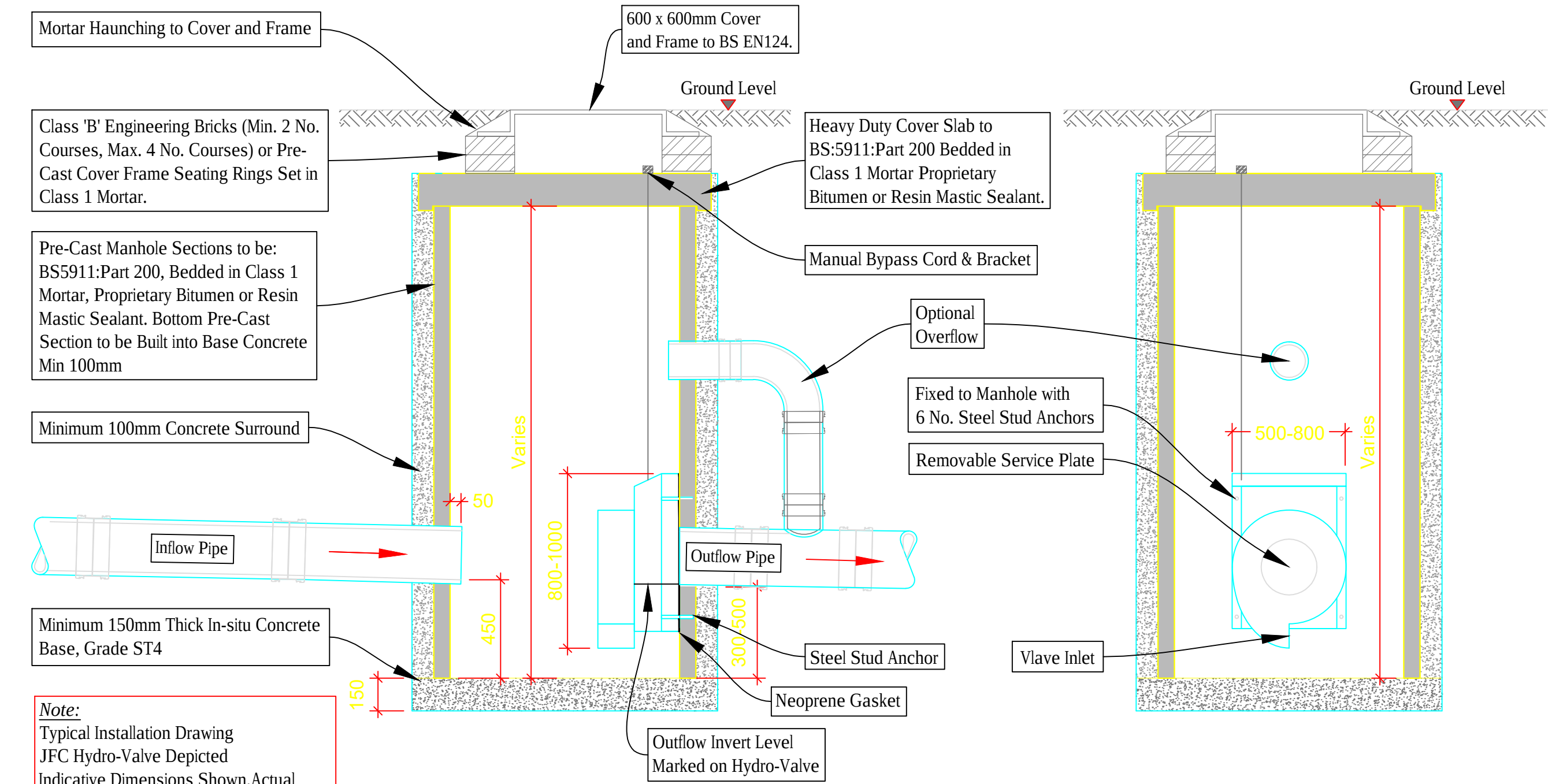


MANHOLE TYPE A - TYPICAL DETAILS

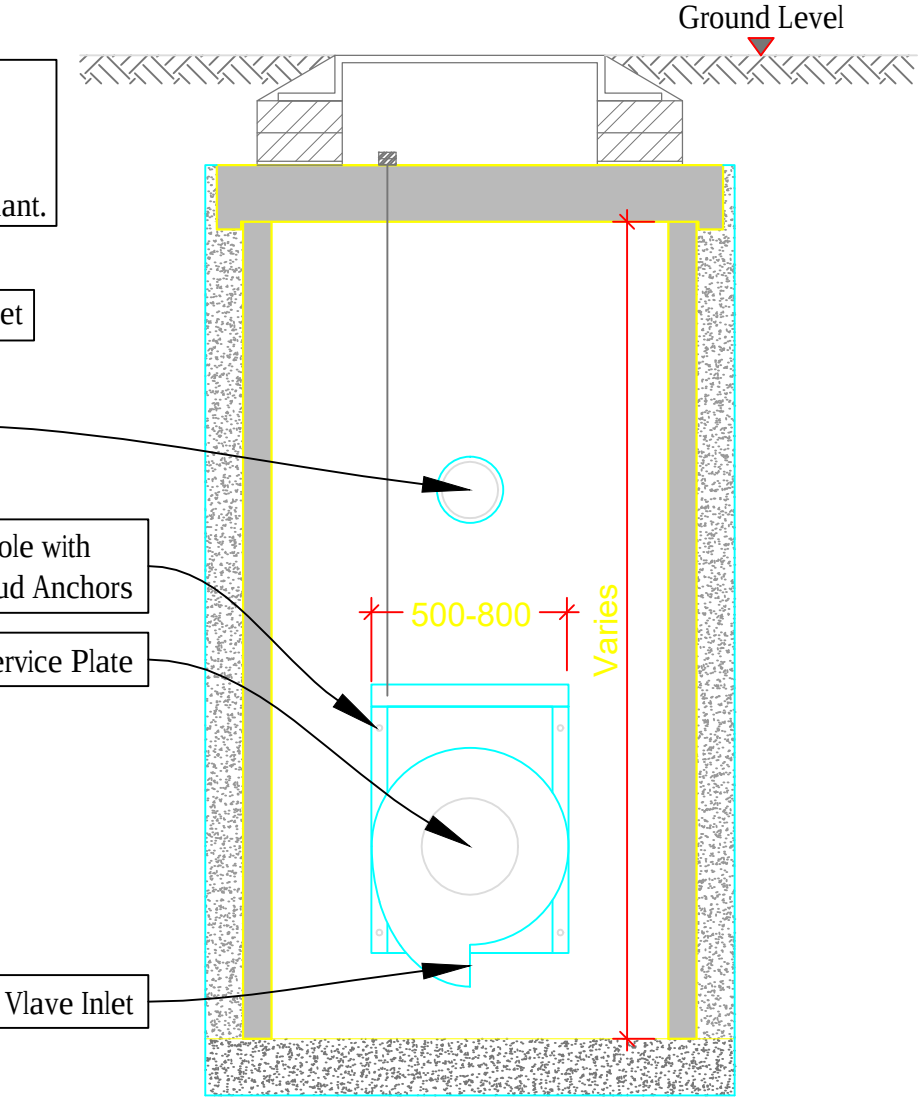


MANHOLE TYPE B - TYPICAL DETAILS

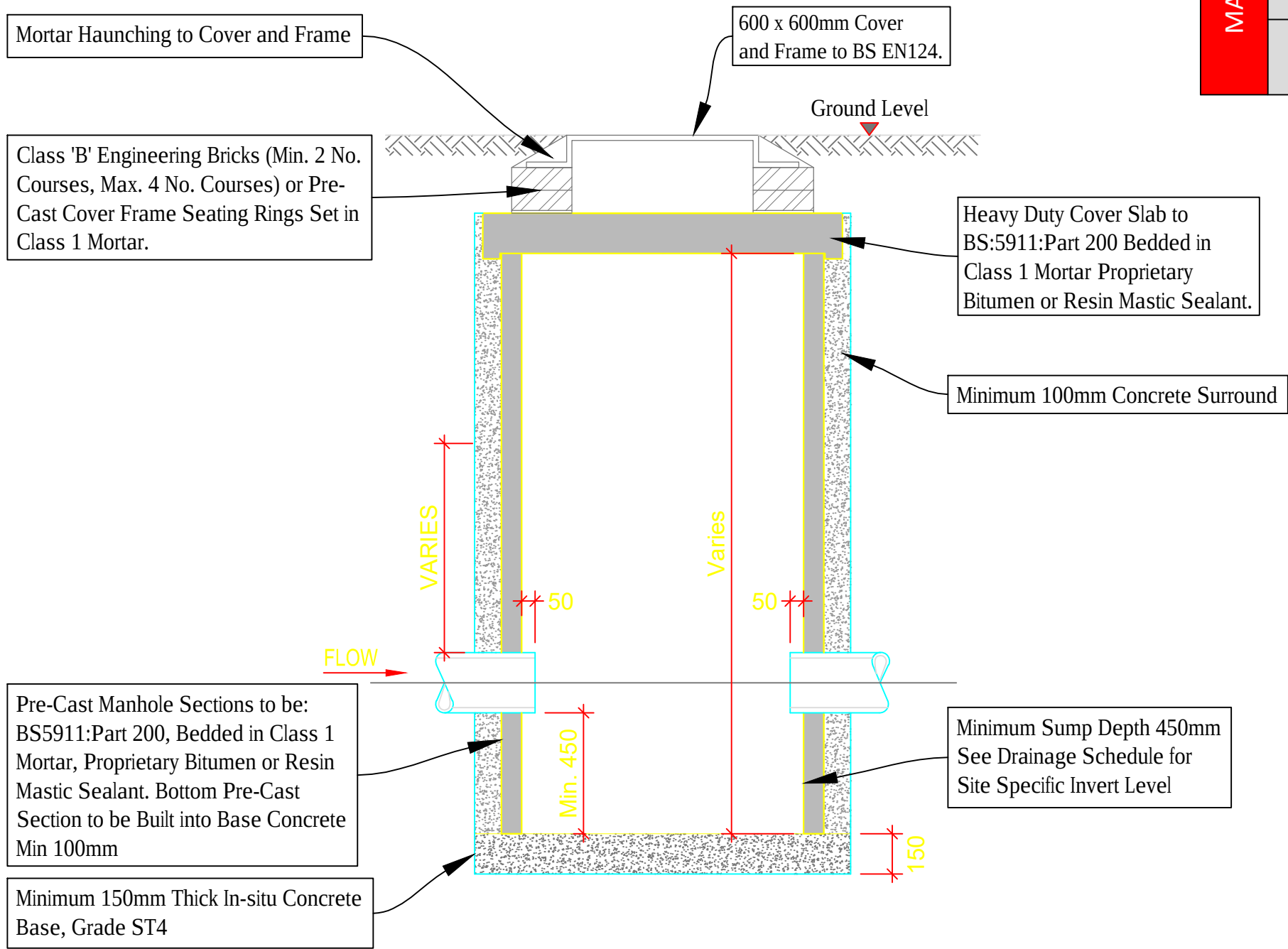
DIAMETERS AND OPENINGS			
MANHOLE DEPTH TO SOFFIT	<1500	LARGEST PIPE Ø	MANHOLE INTERNAL Ø
		150	1050
		300	1200
		450	1350
		700	1500
		900	1800
	>1500	1000	2100
		>1000	SEE SCHEDULE
		100 - 450	1200
		>450	1800+
>3000	>1000	SEE SCHEDULE	600 X 600
	STEPS	1050	600 X 600
>3000	LADDERS	1200	600 X 600



FLOW RESTRICTOR - TYPICAL SECTION DETAIL



FLOW RESTRICTOR - TYPICAL PROFILE DETAIL



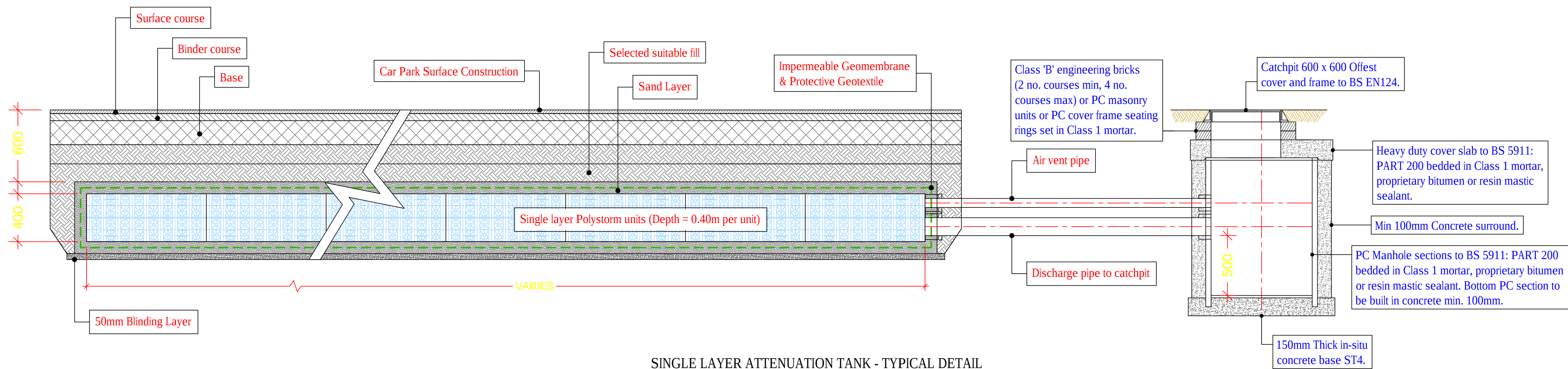
CATCHPIT SECTION - TYPICAL DETAIL

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STATUS: PLANNING			

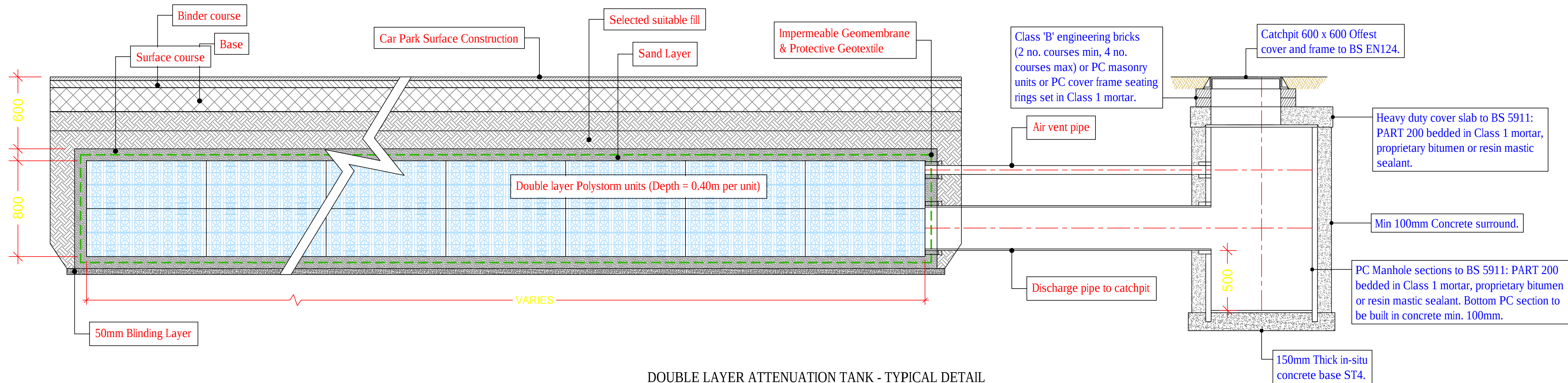
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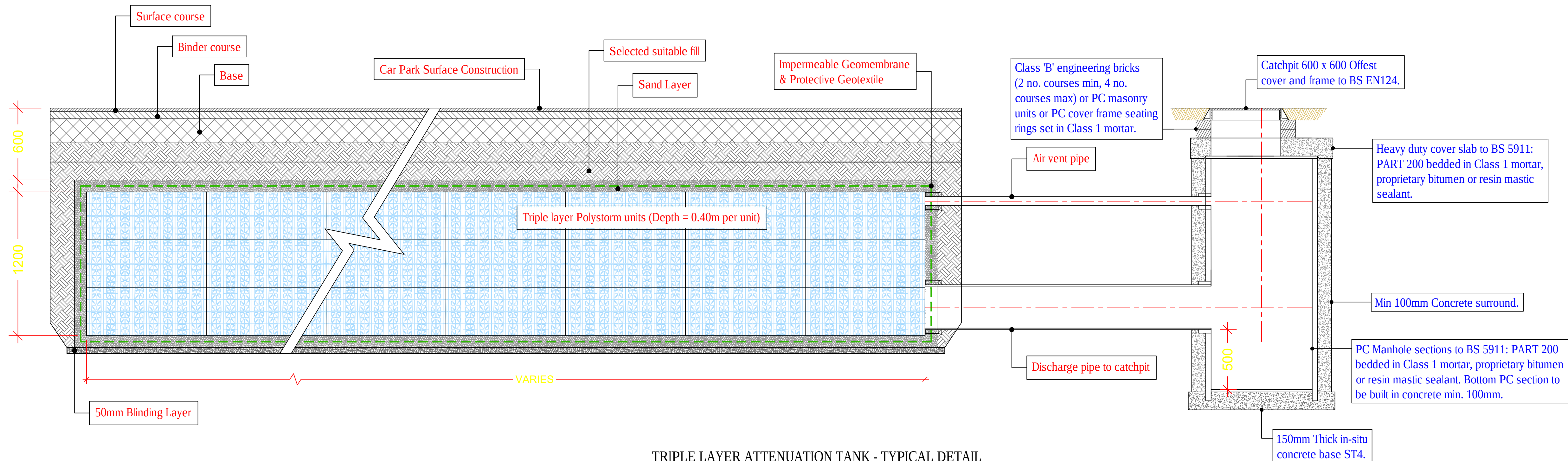
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As Shown	APR. 2022	YA	MM
PROJECT NO:	DRAWING NO:	REVISION:	
-	SD-303	P1	



SINGLE LAYER ATTENUATION TANK - TYPICAL DETAIL



DOUBLE LAYER ATTENUATION TANK - TYPICAL DETAIL



TRIPLE LAYER ATTENUATION TANK - TYPICAL DETAIL

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PROJECT: Proposed Development			
TITLE: Standard Details Attenuation Storage			
SCALE: AT A1: As Shown	DATE: APR_2022	DRAWN: YA	CHECKED: MM
PROJECT NO: -	DRAWING NO: SD-304	REVISION: P1	

Appendix C

Hydraulic Model Calculations (Causeway FLOW)



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	0.800
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
IC-S1	0.025	5.00	96.000	600	382045.821	408909.582	0.900
IC-S2	0.017	5.00	96.000	600	382057.464	408909.498	1.050
IC-S3			96.000	600	382057.547	408921.902	1.220
IC-S4			96.000	600	382045.324	408922.098	1.580
IC-S5	0.044	5.00	95.820	600	382048.147	408937.697	1.200
IC-S6			96.000	600	382033.087	408922.279	1.740
IC-S7	0.020	5.00	96.000	600	382033.559	408909.993	0.950
IC-S8	0.034	5.00	95.800	600	382026.519	408925.205	1.580
IC-S9-HB			95.800	1500	382026.108	408922.472	1.705
OUTFALL			95.480	600	382019.148	408921.764	1.478

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)
1.000	IC-S1	IC-S2	11.643	0.600	95.100	94.950	0.150	77.6	150	5.17	46.7
1.001	IC-S2	IC-S3	12.404	0.600	94.950	94.780	0.170	73.0	150	5.35	46.1
1.002	IC-S3	IC-S4	12.225	0.600	94.780	94.420	0.360	34.0	150	5.46	45.7
2.000	IC-S5	IC-S4	15.852	0.600	94.620	94.420	0.200	79.3	150	5.23	46.5
1.003	IC-S4	IC-S6	12.238	0.600	94.420	94.260	0.160	76.5	150	5.64	45.1
3.000	IC-S7	IC-S6	12.295	0.600	95.050	94.260	0.790	15.6	150	5.08	47.0
1.004	IC-S6	IC-S9-HB	6.982	0.600	94.260	94.170	0.090	77.6	150	5.74	44.7
4.000	IC-S8	IC-S9-HB	2.764	0.600	94.220	94.170	0.050	55.3	150	5.03	47.2
1.005	IC-S9-HB	OUTFALL	6.996	0.600	94.095	94.002	0.093	75.0	225	5.82	44.5

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.142	20.2	3.2	0.750	0.900	0.025	0.0	40	0.834
1.001	1.178	20.8	5.2	0.900	1.070	0.042	0.0	51	0.984
1.002	1.733	30.6	5.2	1.070	1.430	0.042	0.0	42	1.298
2.000	1.130	20.0	5.5	1.050	1.430	0.044	0.0	54	0.971
1.003	1.150	20.3	10.5	1.430	1.590	0.086	0.0	76	1.160
3.000	2.566	45.3	2.5	0.800	1.590	0.020	0.0	24	1.397
1.004	1.142	20.2	12.9	1.590	1.480	0.106	0.0	87	1.209
4.000	1.356	24.0	4.4	1.430	1.480	0.034	0.0	43	1.031
1.005	1.511	60.1	16.9	1.480	1.253	0.140	0.0	81	1.301

Pipeline Schedule

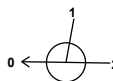
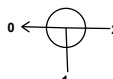
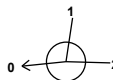
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	11.643	77.6	150	Circular	96.000	95.100	0.750	96.000	94.950	0.900
1.001	12.404	73.0	150	Circular	96.000	94.950	0.900	96.000	94.780	1.070
1.002	12.225	34.0	150	Circular	96.000	94.780	1.070	96.000	94.420	1.430
2.000	15.852	79.3	150	Circular	95.820	94.620	1.050	96.000	94.420	1.430
1.003	12.238	76.5	150	Circular	96.000	94.420	1.430	96.000	94.260	1.590
3.000	12.295	15.6	150	Circular	96.000	95.050	0.800	96.000	94.260	1.590
1.004	6.982	77.6	150	Circular	96.000	94.260	1.590	95.800	94.170	1.480
4.000	2.764	55.3	150	Circular	95.800	94.220	1.430	95.800	94.170	1.480
1.005	6.996	75.0	225	Circular	95.800	94.095	1.480	95.480	94.002	1.253

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	IC-S1	600	Manhole	Adoptable	IC-S2	600	Manhole	Adoptable
1.001	IC-S2	600	Manhole	Adoptable	IC-S3	600	Manhole	Adoptable
1.002	IC-S3	600	Manhole	Adoptable	IC-S4	600	Manhole	Adoptable
2.000	IC-S5	600	Manhole	Adoptable	IC-S4	600	Manhole	Adoptable
1.003	IC-S4	600	Manhole	Adoptable	IC-S6	600	Manhole	Adoptable
3.000	IC-S7	600	Manhole	Adoptable	IC-S6	600	Manhole	Adoptable
1.004	IC-S6	600	Manhole	Adoptable	IC-S9-HB	1500	Manhole	Adoptable
4.000	IC-S8	600	Manhole	Adoptable	IC-S9-HB	1500	Manhole	Adoptable
1.005	IC-S9-HB	1500	Manhole	Adoptable	OUTFALL	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
IC-S1	382045.821	408909.582	96.000	0.900	600				
						0	1.000	95.100	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
IC-S2	382057.464	408909.498	96.000	1.050	600		1	1.000	94.950	150
						0	1.001	94.950	150	
IC-S3	382057.547	408921.902	96.000	1.220	600		1	1.001	94.780	150
						0	1.002	94.780	150	
IC-S4	382045.324	408922.098	96.000	1.580	600		1	2.000	94.420	150
							2	1.002	94.420	150
							0	1.003	94.420	150
IC-S5	382048.147	408937.697	95.820	1.200	600		0	2.000	94.620	150
							1	3.000	94.260	150
IC-S6	382033.087	408922.279	96.000	1.740	600		2	1.003	94.260	150
							0	1.004	94.260	150
IC-S7	382033.559	408909.993	96.000	0.950	600		0	3.000	95.050	150
							0	4.000	94.220	150
IC-S8	382026.519	408925.205	95.800	1.580	600		0	4.000	94.220	150
							1	4.000	94.170	150
IC-S9-HB	382026.108	408922.472	95.800	1.705	1500		2	1.004	94.170	150
							0	1.005	94.095	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
OUTFALL	382019.148	408921.764	95.480	1.478	600	1 	1.005	94.002	225

Simulation Settings

Rainfall Methodology	FSR	Winter CV	0.840	Check Discharge Rate(s)	✓
FSR Region	England and Wales	Analysis Speed	Normal	1 year (l/s)	0.0
M5-60 (mm)	20.000	Skip Steady State	x	30 year (l/s)	0.0
Ratio-R	0.300	Drain Down Time (mins)	240	100 year (l/s)	0.0
Summer CV	0.750	Additional Storage (m³/ha)	20.0	Check Discharge Volume	x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

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

Pre-development Discharge Rate

Site Makeup	Brownfield	PIMP (%)	100	Betterment (%)	0	Q 100 year (l/s)
Brownfield Method	MRM	CV	0.750	Q 1 year (l/s)		
Contributing Area (ha)	0.017	Time of Concentration (mins)	30.00	Q 30 year (l/s)		

Node IC-S9-HB Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	94.170	Product Number	CTL-SHE-0177-1690-1500-1690
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	16.9	Min Node Diameter (mm)	1500

Node IC-S8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	94.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	13

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	25.0	0.0	1.000	25.0	0.0	1.001	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.40%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	IC-S1	10	95.140	0.040	3.2	0.0336	0.0000	OK
15 minute winter	IC-S2	10	95.005	0.055	5.4	0.0334	0.0000	OK
15 minute winter	IC-S3	11	94.822	0.042	5.3	0.0119	0.0000	OK
15 minute winter	IC-S4	11	94.502	0.082	10.8	0.0233	0.0000	OK
15 minute winter	IC-S5	10	94.674	0.054	5.6	0.0548	0.0000	OK
15 minute winter	IC-S6	11	94.364	0.104	13.2	0.0293	0.0000	OK
15 minute winter	IC-S7	10	95.074	0.024	2.6	0.0171	0.0000	OK
15 minute winter	IC-S8	14	94.317	0.097	8.0	2.4696	0.0000	OK
15 minute winter	IC-S9-HB	13	94.315	0.220	13.2	0.3896	0.0000	OK
15 minute summer	OUTFALL	1	94.002	0.000	10.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	IC-S1	1.000	IC-S2	3.2	0.659	0.157	0.0561	
15 minute winter	IC-S2	1.001	IC-S3	5.3	1.073	0.254	0.0613	
15 minute winter	IC-S3	1.002	IC-S4	5.3	0.767	0.172	0.0851	
15 minute winter	IC-S4	1.003	IC-S6	10.8	0.941	0.529	0.1398	
15 minute winter	IC-S5	2.000	IC-S4	5.5	0.731	0.278	0.1224	
15 minute winter	IC-S6	1.004	IC-S9-HB	13.2	0.905	0.656	0.1021	
15 minute winter	IC-S7	3.000	IC-S6	2.6	0.834	0.057	0.0906	
15 minute winter	IC-S8	4.000	IC-S9-HB	5.5	0.496	0.228	0.0407	
15 minute winter	IC-S9-HB	Hydro-Brake®	OUTFALL	11.1				8.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.40%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	IC-S1	10	95.167	0.067	7.8	0.0564	0.0000	OK
15 minute winter	IC-S2	10	95.043	0.093	13.0	0.0564	0.0000	OK
15 minute winter	IC-S3	12	94.969	0.189	12.9	0.0534	0.0000	SURCHARGED
15 minute winter	IC-S4	12	94.911	0.491	23.1	0.1388	0.0000	SURCHARGED
15 minute winter	IC-S5	12	94.981	0.361	13.8	0.3671	0.0000	SURCHARGED
15 minute winter	IC-S6	13	94.687	0.427	27.1	0.1207	0.0000	SURCHARGED
15 minute winter	IC-S7	10	95.088	0.038	6.3	0.0266	0.0000	OK
30 minute winter	IC-S8	24	94.559	0.339	14.1	8.6932	0.0000	SURCHARGED
30 minute winter	IC-S9-HB	24	94.557	0.462	23.2	0.8161	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	94.002	0.000	16.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	IC-S1	1.000	IC-S2	7.7	0.821	0.383	0.1113	
15 minute winter	IC-S2	1.001	IC-S3	12.9	1.313	0.621	0.1654	
15 minute winter	IC-S3	1.002	IC-S4	11.6	0.836	0.379	0.2152	
15 minute winter	IC-S4	1.003	IC-S6	21.4	1.217	1.054	0.2154	
15 minute winter	IC-S5	2.000	IC-S4	12.2	0.846	0.611	0.2791	
15 minute winter	IC-S6	1.004	IC-S9-HB	26.0	1.477	1.288	0.1229	
15 minute winter	IC-S7	3.000	IC-S6	6.3	0.999	0.138	0.1296	
30 minute winter	IC-S8	4.000	IC-S9-HB	11.6	0.659	0.485	0.0487	
30 minute winter	IC-S9-HB	Hydro-Brake®	OUTFALL	16.8				27.6

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.40%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	IC-S1	13	95.776	0.676	13.2	0.5667	0.0000	FLOOD RISK
15 minute winter	IC-S2	13	95.745	0.795	19.4	0.4825	0.0000	FLOOD RISK
15 minute winter	IC-S3	13	95.649	0.869	15.9	0.2461	0.0000	SURCHARGED
15 minute winter	IC-S4	13	95.549	1.129	31.0	0.3195	0.0000	SURCHARGED
15 minute winter	IC-S5	12	95.717	1.097	23.2	1.1141	0.0000	FLOOD RISK
30 minute winter	IC-S6	23	95.160	0.900	34.6	0.2547	0.0000	SURCHARGED
30 minute winter	IC-S7	23	95.166	0.116	8.6	0.0819	0.0000	OK
30 minute winter	IC-S8	29	94.995	0.775	27.7	19.9045	0.0000	SURCHARGED
30 minute winter	IC-S9-HB	28	94.993	0.898	32.7	1.5866	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	94.002	0.000	16.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	IC-S1	1.000	IC-S2	11.0	0.853	0.544	0.2050	
15 minute winter	IC-S2	1.001	IC-S3	15.9	1.307	0.766	0.2184	
15 minute winter	IC-S3	1.002	IC-S4	14.3	0.820	0.466	0.2152	
15 minute winter	IC-S4	1.003	IC-S6	29.5	1.675	1.451	0.2154	
15 minute winter	IC-S5	2.000	IC-S4	19.3	1.097	0.967	0.2791	
30 minute winter	IC-S6	1.004	IC-S9-HB	32.7	1.856	1.618	0.1229	
30 minute winter	IC-S7	3.000	IC-S6	8.6	1.010	0.190	0.1983	
30 minute winter	IC-S8	4.000	IC-S9-HB	-14.1	-0.800	-0.588	0.0487	
30 minute winter	IC-S9-HB	Hydro-Brake®	OUTFALL	16.9				47.1

Surface Water Flow Assessment

Site Pilsworth

Date 07-Sep-22

	Existing	Proposed
Total area =	1731.93 m ²	1731.93 m ²
Impermeable area flowing to Surface Water, Ap =	1731.93 m ²	1731.93 m ²
Roofs	m ²	m ²
Pavings	m ²	m ²
Landscape	m ²	m ²
Rainfall intensity, R=	50 mm/hr	
where R		
Runoff, Q = $2.78 \cdot A_p \cdot R$	24.1 l/s	
Required runoff reduction=	30 %	
Allowable discharge =	16.9 l/s	