

Drainage Strategy Report
Kingsway, Rochdale, OL16 4PS
for
Euro Garages Ltd.

Revision	Date of issue	Comments	Prepared By	Checked By
01	19.10.2023	First Issue	RCTS	KTY
02	20.10.2023	Updated Site Layout	RCTS	KTY



iSTRUCT
consultants ltd

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

Contents

1.0	Project Information Brief	1
2.0	Introduction.....	2
3.0	Existing Site Drainage	3
4.0	Proposed Site Drainage	4
5.0	Drawings and Calculations	7

Appendices



1.0 Project Information Brief

Project	Kingsway, Rochdale
Project Location	Sir Isaac Newton Way, OL16 4PS
Client	Euro Garages Ltd
Project Status	Planning
Construction Value	TBC
Our Reference	LM23014



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 the Euro Garages Ltd planning application for their proposed retail development at Kingsway Business Park, Rochdale.

The proposed development is comprised of a drive-thru coffee shop, drive-thru restaurant, petrol filling station (PFS), car wash, shared site access road and associated parking and landscaping.

2.2 Site Description and Location

The site is an existing greenfield located as a corner plot at the roundabout junction between Sir Isaac Newton Way and Michael Faraday Avenue at the Kingsway Business Park in Rochdale. It is a quadrant shaped plot of approx. 1.39ha in size.

The site is situated off the A6193 Sir Isaac Newton Way which traverses the Kingsway Business Park from its junction with the A664 Rochdale Bypass and Junction 21 of the M62.

The post code for the site is OL16 4PS, with OS Grid reference of E391623, N411994. A location plan of the site is outlined below in Figure 1.

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



Figure 1: Site Location Plan (@Google Maps)

3.0 Existing Site Drainage

The existing topographical survey of the site indicates the presence of separate public SW (450 dia) and FW (225 dia) sewers and manholes within the access road to the site, off Michael Faraday Avenue. These provide direct outfall connection points for the surface water and foul water drainage from the proposed development, subject to S106 connection approval from the statutory sewerage authority, United Utilities.



4.0 Proposed Site Drainage

4.1 Surface Water Drainage

With the site being an existing greenfield, an estimation of the surface water runoff and discharge rate carried out by the UK SuDS HRWallingford estimation tool (www.uksuds.com) indicated a Qbar rate of 0.42l/s for the site. However, the drainage solution proposed for the new development has been designed in accordance with the principles of sustainable drainage to a restricted discharge of **2.0l/s** in line with the minimum recommended flow rate by the estimation tool, to avoid blockage at the discharge point. A copy of the discharge rate estimation for the site, by the estimation tool, is included in Appendix C.

The benefits of incorporating SuDS into a drainage solution include:

- i. Reducing runoff volumes, peak flows and discharge rates to watercourses or sewers subsequently reducing the risk of flooding downstream (Water quantity)
- ii. Improving the water quality into receiving bodies by removing or reducing the pollutants in runoff water (Water quality)
- iii. Creating and sustaining better places for nature (Biodiversity)
- iv. Creating and sustaining better places for people (Amenity)
- v. Allowing development to adapt to the effects of climate change.

The following SuDS features have been incorporated into the drainage strategy for the site, to enhance its sustainable drainage index:

1. Discharge limit of 2.0l/s for surface runoff and offsite discharge control.
2. Attenuation tanks with a total volume of 712m³ providing both volume control and water quality and amenity value benefits.
3. Soft landscaped and planting areas within the architectural layout of the development.
4. Surface water runoff from the petrol station forecourt and offset fill (OSF) areas have been designed in accordance with **Chapter 8 of the Blue Book of the Association of Petroleum & Explosives Administration (APEA)** for pollution control, contaminated water, and disposal. Therefore, surface runoff from the forecourt, and offset fill areas, have been connected to the foul drainage network via a jet wash separator and 10000L forecourt interceptor (oil separator) respectively.
5. There is no nearby local surface water body to discharge to.
6. It is recommended that infiltration testing to BRE365 be carried to assess feasibility of soakaways. If feasible, the underground storage tanks will be resized to act as soakaways.

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 40% climate change event. The simulation of the network's performance has also been carried out with the restricted discharge rate of **2.0l/s**, and an attenuation tank



appropriately sized for storage.

The total attenuation storage required is **712m³** for 100yr rainfall event with 40% Climate Change. No flooding occurs in the drainage network proposed for this development.

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 filling station shall be maintained by the owner's 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
Attenuation Pond	Inspect inlets, outlets and overflows for blockages, and clear if required. Inspect banksides, structures, pipework etc for evidence of physical damage. Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies. Reseed areas of poor vegetation. Remove litter and debris. Cut grass and manage other vegetation. Remove sediments from inlets/outlets and main basin when required.
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.
Channel drains (Aco or similar)	- Regularly inspect and take off grating to remove debris and clogged up deposits to allow free flow of water through channel drains.
Inspection chambers, Manholes, Silt Trap	Inspect six-monthly, empty every 12 months and after every major storm or local flood event

4.4 Foul Drainage

It is proposed to utilise a separate standard gravity pipe system for draining foul water to discharge into the existing foul outfall demarcation chamber prior to connecting into the public sewer network.

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



5.0 Drawings and Calculations

LM23014-100 Drainage Strategy Plan

LM23014-150 Catchment Areas Plan

LM23014-200 Exceedance Flow Plan

SD-300 Standard Details – Surfaces

SD-301 Standard Details – Joints

SD-302 Standard Details – Drainage

SD-303 Standard Details – Manholes

SD-304 Standard Details – Attenuation Tanks

Hydraulic Model Calculation (FLOW)



Appendix A

Topographical Survey



iSTRUCT
consultants ltd

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

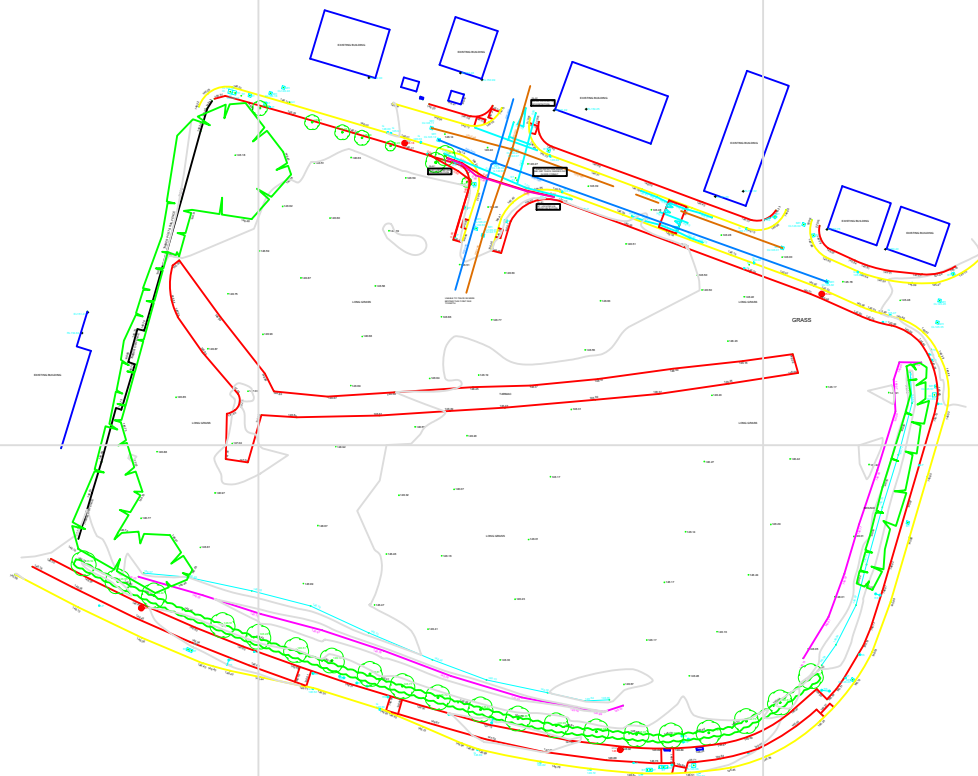
[illegible][illegible]

NOTE 1
This utility survey has been undertaken using:
A. Remote sensing: 40000 + 40000: 125
B. This Geoscience Group Probing Radar

NOTE 2

Power connector features shown on this drawing are shown as an industrial service line. This does not necessarily represent the number of cables actually present and it is possible that there could be multi numbers of cables including WY, LV and communication transmission cables following the same trace line. There could be a different signal, the trace signal from the deeper cables being modulated by signal outlets from the shallowest service above. Cable runs could also be present running parallel to the single line shown.

There are two cases examined: that GPC can be achieved either scanning or serial one is conductive cells and the second is the detection conductive conductive cells.

[illegible][illegible]

STATION	EASTING	NORTHING	LEVEL (m)
A	391311.801	412329.938	145.927
B	391228.928	412359.928	146.182
C	391179.747	412287.715	146.478
D	391271.673	412239.845	146.907

ABBREVIATIONS

AN	AIR VALVE/VENT	IC	INSPECT CHAMBER
BOL	BOLTS	IR	INVERT LEVEL
BS	BOTTOM BEACON	JP	JAPANESE COUNTRY CODE
BSH	BOLLARD	LM	LAMP HOLE
BL	BLIND LEVEL	LP	LAMP POST
BSB	BUS STOP	HP	HOSE PLATE
BT	BUSINESS TELECOM	HW	HANDWHEEL
CL	COVER LEVEL	PG	POST/SIGN POST
DI	DILAPIDATED	PO	POST BOX
DN	DOWNED	PK	UNKNOWN SERVICE
DNL	DOWNED LEVEL	RE	RECKING EYE
ELE	ELE. JUNCT. BOX	RL	RAIL
EP	ELECTRICITY POLE	RS	ROAD SIGN
FI	FEET HIGHWAY	ST	STOP MAT
FL	FLOOR LEVEL	TR	TRAIL HOLE
FOS	FOOT OF SEGMENT	TH	THATCH LIGHT
FP	FLAG POLE	TP	TELEGRAPH POLE
G	GULLY	TV	CABLE TV BOX
GN	GN. METER	US	UNABLE TO LIFT
WV	WATER VALVE		

SYMBOLS

	SURVEY STATION		TREE
	OH ELEC CABLE		BENCH MARK
	OH PHONE LINE		TRIAL PIT
	CANOPY HEDGE		BOREHOLE

NOTES

- A) ONLY MANHOLES AND SERVICES VISIBLE AT TIME OF SURVEY SHOWN
- B) LOCAL GRID USED AND ORIENTATED TO MAGNETIC NORTH
- C) LEVELS IN METRES RELATED TO G.P.S.
- D) DRAINAGE INFORMATION TAKEN FROM LOCAL AUTHORITY RECORDS. INFORMATION MUST BE CHECKED PRIOR TO WORK COMMENCING

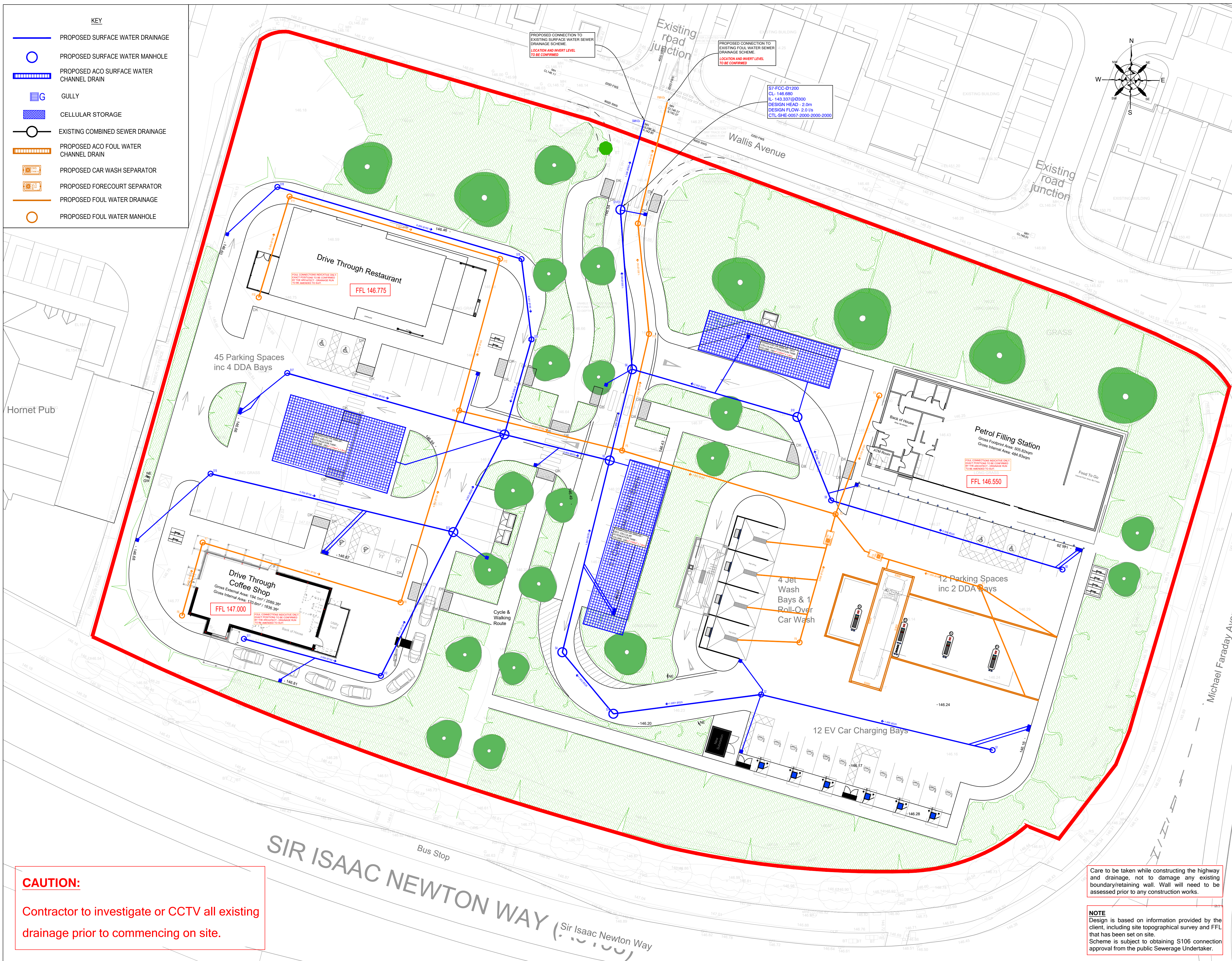
Rev	Description	Date
	PROPOSED DEVELOPMENT AT WALLIS AVENUE, ROCHDALE	
	EUROGARAGES	
	TOPOGRAPHICAL SURVEY	
EG454/T00	Surveyed	CF
	Drawn	CF
	Date	APRIL 2023
	Scale	1:500 @ A1

Surveying Consultants Ltd
LAND SURVEYORS & SITE ENGINEERS
AYREFIELD COTTAGE
AYREFIELD ROAD
ROBY MILL
UPHOLLAND
LANCASHIRE

Appendix B

Drawings





GENERAL NOTES

1. THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF ISTRUCT CONSULTANTS LTD.
2. DO NOT SCALE FROM THIS DRAWING.
3. ALL DIMENSIONS TO BE CHECKED ON SITE AND CO-ORDINATE WITH RELEVANT ARCHITECT'S DRAWINGS. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO CONSTRUCTION.
4. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
5. ALL LEVELS IN METERS.
6. SIZES HEREON SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
7. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS & SPECIFICATIONS.

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECT'S DETAILS.
2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT BRITISH STANDARDS, CODES OF PRACTICE, BUILDING REGULATIONS AND WITH SEWERS FOR ADOPTION 6TH EDITION GUIDANCE.
3. THE EXACT POSITION, 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. ALL UNCOVERED AND SHALLOW PIPEWORK TO BE PROTECTED AGAINST CONSTRUCTION TRAFFIC AS PART OF THE CONTRACTORS TEMPORARY WORKS REQUIREMENTS.
5. COVER LEVELS SHOWN ARE APPROXIMATE ONLY. SUBJECT TO THE ARCHITECT'S EXTERNAL WORKS AND LANDSCAPING SCHEME.
6. ALL CONNECTIONS TO ROAD GULLIES AND CHANNELS SHALL BE 150MM NOMINAL BORE PIPEWORK. CONNECTIONS TO RWPS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF RWP SIZES AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW.
7. CONNECTIONS TO FOUL TERMINAL FITTINGS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF ABOVE GROUND PIPE DIAMETERS AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW.
8. ALL PIPEWORK TO BE VITRIFIED CLAY UNLESS OTHERWISE NOTED.
9. ALL PIPES CONNECTING TO ADOPTED MANHOLES UP TO AND INCLUDING 300MM DIA. TO BE VITRIFIED CLAY.
10. ALL PIPES CONNECTING TO ADOPTED MANHOLES GREATER THAN 300MM DIA. TO BE CONCRETE.
11. ALL PIPEWORK ENTERING AND EXITING MANHOLES TO BE CONNECTED WITH PIPE SOFFITS LEVEL.
12. PRE-FORMED CHANNELS TO BE USED AT ALL MANHOLES.
13. HIGH STRENGTH CONCRETE BENCHING TO BE STEEL TROWELLED TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS AND LAID IN ACCORDANCE WITH THE SPECIFICATION.
14. PIPE BENDS TO BE PROVIDED TO SUIT DIRECTION OF FLOW.
15. ALL MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON HEAVY DUTY GRADE D400 DOUBLE TRIANGULAR TO BS EN 124 UNLESS OTHERWISE NOTED. COVERS TO BE LABELLED 'FW' AND 'SW' AS APPROPRIATE.
16. GULLY TOPS AND MANHOLE COVERS TO BE PROVIDED IN ACCORDANCE WITH BS EN 124.
17. ALL MANHOLE COVERS LOCATED INTERNALLY, TO BE RECESSED, DOUBLE SEAL, AIRTIGHT TYPE, ALUMINIUM OR STEEL, RECESS DEPTH TO ARCHITECT'S REQUIREMENTS TO SUIT FINISHES ETC.
18. ALL NEW DRAINAGE TO BE CONSTRUCTED ADJACENT NEW AND PROPOSED TREE PLANTING TO BE PROTECTED AGAINST ROOT ACTIVITY USING ROOT-CONTROL / ROOT BARRIER MATERIAL BY GREEN-TECH. ALL IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
19. FIRST FLEXIBLE JOINT IN PIPES ADJACENT TO A MANHOLE SHALL BE 600MM MAX. FROM INSIDE FACE OF MANHOLE. CONNECTING TO ROCKER PIPE, FOR PIPE DIAMETERS 150MM - 450MM THE ROCKER PIPE LENGTH SHALL BE 500MM - 750MM AND FOR PIPE DIAMETERS 451MM - 675MM THE ROCKER PIPE LENGTH SHALL BE 750MM - 1000MM.
20. MANHOLES WITH OUTGOING PIPES GREATER THAN 600MM DIA. SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER APPROVED SAFETY DEVICES.
21. WHERE THE FORMATION OF A PIPE TRENCH IS ABOVE ORIGINAL GROUND LEVEL, LEVELS ARE TO BE MADE UP WITH COMPACTED DTP TYPE 2 MATERIAL, OR BETTER.
22. ALL PRIVATE DRIVES WHICH FALL TOWARDS A PUBLIC HIGHWAY AND EXCEED TWO PARKING BAYS IN AREA ARE TO BE PROVIDED WITH A SUITABLE GULLY OR DRAINAGE CHANNEL TO PREVENT WATER DISCHARGING ONTO THE HIGHWAY.
23. ALL BURIED CONCRETE MUST CATER FOR CLASS 2 SULPHATES CONDITIONS IN ACCORDANCE WITH TABLE 1 OF BRE DIGEST 363.
24. 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 1200MM COVER IN ROADS OR PRIVATE DRIVEWAYS USED BY COMMERCIAL VEHICLES. WHERE CONCRETE SURROUND IS SPECIFIED FLEXIBILITY OF JOINTS IS TO BE MAINTAINED BY USING COMPRESSIBLE BITUMEN IMPREGNATED FIBREBOARD AT EACH POINT.

P02	REVISED SITE LAYOUT	20.10.23	RCTS
P01	INITIAL ISSUE	20.10.23	RCTS
Rev.	Amendments	Date	By

Revisions

 **iSTRUCT**
consultants ltd

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS

Tel: 01582 455738 Email: info@istructconsultants.com

Client:



Project:
KINGSWAY, SIR ISAAC NEWTON WAY
ROCHDALE, OL16 4PS

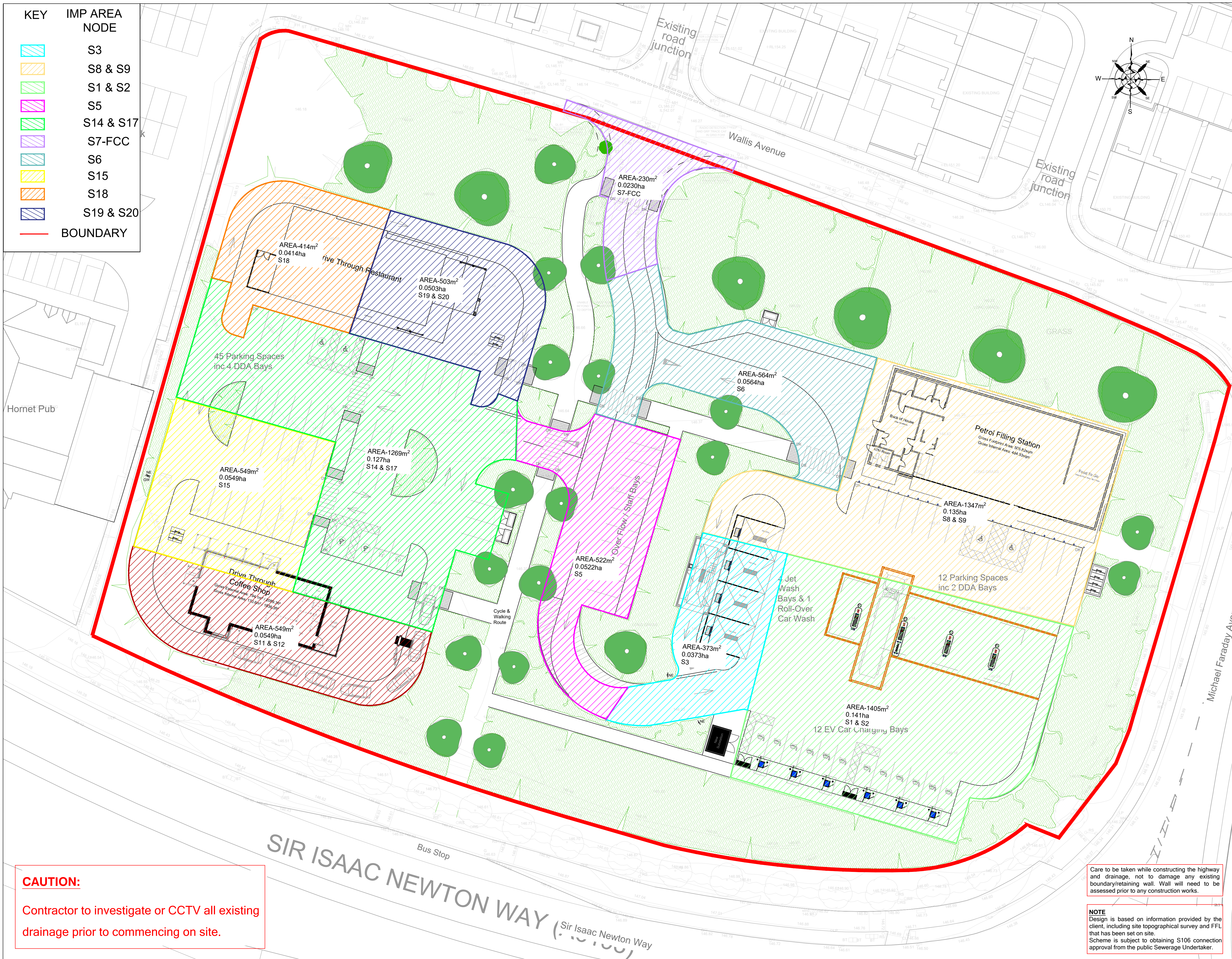
Title:
DRAINAGE STRATEGY PLAN

At original size: A1

Status:	Drawn By:	Date:	Scale:
PRELIMINARY	RCTS	20.10.2023	1:250

Drawing No.:	Rev:
LM23014-100	P02

KEY	IMP AREA NODE
	S3
	S8 & S9
	S1 & S2
	S5
	S14 & S17
	S7-FCC
	S6
	S15
	S18
	S19 & S20
	BOUNDARY



CAUTION:

Contractor to investigate or CCTV all existing drainage prior to commencing on site.

Care to be taken while constructing the highway and drainage, not to damage any existing boundary/retaining wall. Wall will need to be assessed prior to any construction works.

NOTE
Design is based on information provided by the client, including site topographical survey and FFL that has been set on site.
Scheme is subject to obtaining S106 connection approval from the public Sewerage Undertaker.

GENERAL NOTES

1. THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF ISTRUCT CONSULTANTS LTD.
2. DO NOT SCALE FROM THIS DRAWING.
3. ALL DIMENSIONS TO BE CHECKED ON SITE AND CO-ORDINATE WITH RELEVANT ARCHITECT'S DRAWINGS. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO COMMENCEMENT OF CONSTRUCTION.
4. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
5. ALL LEVELS IN METERS.
6. SIZES HEREON SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
7. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS & SPECIFICATIONS.

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECT'S DETAILS.
2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT BRITISH STANDARDS, CODES OF PRACTICE, BUILDING REGULATIONS AND WITH SEWERS FOR ADOPTION 6TH EDITION GUIDANCE.
3. THE EXACT POSITION, 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. ALL UNCOVERED AND SHALLOW PIPEWORK TO BE PROTECTED AGAINST CONSTRUCTION TRAFFIC AS PART OF THE CONTRACTORS TEMPORARY WORKS REQUIREMENTS. COVER LEVELS SHOWN ARE APPROXIMATE ONLY. SUBJECT TO THE ARCHITECT'S EXTERNAL WORKS AND LANDSCAPING SCHEME.
5. ALL CONNECTIONS TO ROAD GULLIES AND CHANNELS SHALL BE 150MM NOMINAL BORE PIPEWORK. CONNECTIONS TO RWPS TO BE 100MM NOMINAL BORE PIPEWORK. SUBJECT TO CONFIRMATION OF RWP SIZES AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW. CONNECTIONS TO FOUL TERMINAL FITTINGS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF ABOVE GROUND PIPE DIAMETERS AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW.
6. ALL PIPEWORK TO BE VITRIFIED CLAY UNLESS OTHERWISE NOTED.
7. ALL PIPES CONNECTING TO ADOPTED MANHOLES UP TO AND INCLUDING 300MM DIA. TO BE VITRIFIED CLAY.
8. ALL PIPES CONNECTING TO ADOPTED MANHOLES GREATER THAN 300MM DIA. TO BE CONCRETE.
9. ALL PIPEWORK ENTERING AND EXITING MANHOLES TO BE CONNECTED WITH PIPE SOFFITS LEVEL.
10. PRE-FORMED CHANNELS TO BE USED AT ALL MANHOLES.
11. HIGH STRENGTH CONCRETE BENCHING TO BE STEEL TROWELLED TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS AND LAID IN ACCORDANCE WITH THE SPECIFICATION.
12. PIPE BENDS TO BE PROVIDED TO SUIT DIRECTION OF FLOW.
13. ALL MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON HEAVY DUTY GRADE D400 DOUBLE TRIANGULAR TO BS EN 124 UNLESS OTHERWISE NOTED. COVERS TO BE LABELLED 'FW' AND 'SW' AS APPROPRIATE.
14. GULLY TOPS AND MANHOLE COVERS TO BE PROVIDED IN ACCORDANCE WITH BS EN 124.
15. ALL MANHOLE COVERS LOCATED INTERNALLY, TO BE RECESSED, DOUBLE SEAL, AIRTIGHT TYPE, ALUMINIUM OR STEEL, RECESS DEPTH TO ARCHITECT'S REQUIREMENTS TO SUIT FINISHES ETC.
16. ALL NEW DRAINAGE TO BE CONSTRUCTED ADJACENT NEW AND PROPOSED TREE PLANTING TO BE PROTECTED AGAINST ROOT ACTIVITY USING ROOT CONTROL, ROOT BARRIER MATERIAL BY GREEN-TECH. ALL IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
17. FIRST FLEXIBLE JOINT IN PIPES ADJACENT TO A MANHOLE SHALL BE 600MM MAX. FROM INSIDE FACE OF MANHOLE. CONNECTING TO ROCKER PIPE, FOR PIPE DIAMETERS 150MM - 450MM THE ROCKER PIPE LENGTH SHALL BE 500MM - 750MM AND FOR PIPE DIAMETERS 451MM - 675MM THE ROCKER PIPE LENGTH SHALL BE 750MM - 1000MM.
18. MANHOLES WITH OUTGOING PIPES GREATER THAN 600MM DIA. SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER APPROVED SAFETY DEVICES.
19. WHERE THE FORMATION OF A PIPE TRENCH IS ABOVE ORIGINAL GROUND LEVEL, LEVELS ARE TO BE MADE UP WITH COMPACTED DTP TYPE 2 MATERIAL OR BETTER.
20. ALL PRIVATE DRIVES WHICH FALL TOWARDS A PUBLIC HIGHWAY AND EXCEED TWO PARKING BAYS IN AREA ARE TO BE PROVIDED WITH A SUITABLE GULLY OR DRAINAGE CHANNEL TO PREVENT WATER DISCHARGING ONTO THE HIGHWAY.
21. ALL BURIED CONCRETE MUST CATER FOR CLASS 2 SULPHATES CONDITIONS IN ACCORDANCE WITH TABLE 1 OF BRE DIGEST 363.
22. 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 1200MM COVER IN ROADS OR PRIVATE DRIVEWAYS USED BY COMMERCIAL VEHICLES. WHERE CONCRETE SURROUND IS SPECIFIED FLEXIBILITY OF JOINTS IS TO BE MAINTAINED BY USING COMPRESSIBLE BITUMEN IMPREGNATED FIBREBOARD AT EACH POINT.

P02	REVISED SITE LAYOUT	20.10.23	RCTS
P01	INITIAL ISSUE	20.10.23	RCTS
Rev.	Amendments	Date	By

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

Client:

Project:
KINGSWAY, SIR ISAAC NEWTON WAY
ROCHDALE, OL16 4PS

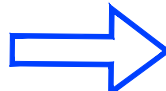
Title:
CATCHMENT AREAS PLAN

At original size A1

Status:	Drawn By:	Date:	Scale:
PRELIMINARY	RCTS	20.10.2023	1:250

Drawing No.:	Rev:
LM23014-150	P02

FLOOD ROUTING DIRECTION ARROW



ROUTING SHOWN IS FOR EVENTS IN EXCEEDANCE OF THE DESIGN STORM

GULLY

Pub Car Park

Hornet Pub

45 Parking Spaces
inc 4 DDA Bays

Drive Through Restaurant

Drive Through
Coffee Shop
Gross External Area: 194.1m² / 2089.3ft²
Gross Internal Area: 170.9m² / 1836.3ft²

Cycle & Walking
Route

11 Over Flow / Staff Bays

4 Jet Wash
Bays & 1
Roll-Over
Car Wash

12 Parking Spaces
inc 2 DDA Bays

12 EV Car Charging Bays

Petrol Filling Station
Gross Floor Area: 925.52sqm
Gross Internal Area: 494.65sqm

Existing
road
junction

Existing
road
junction

Wallis Avenue

Michael Faraday Ave

SIR ISAAC NEWTON WAY

Bus Stop

CAUTION:

Contractor to investigate or CCTV all existing drainage prior to commencing on site.

Care to be taken while constructing the highway and drainage, not to damage any existing boundary/retaining wall. Wall will need to be assessed prior to any construction works.

NOTE
Design is based on information provided by the client, including site topographical survey and FFL that has been set on site.
Scheme is subject to obtaining S106 connection approval from the public Sewerage Undertaker.

GENERAL NOTES

- 1.1. THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF ISTRUCT CONSULTANTS LTD.
- 1.2. DO NOT SCALE FROM THIS DRAWING
- 1.3. ALL DIMENSIONS TO BE CHECKED ON SITE AND CO-ORDINATE WITH RELEVANT ARCHITECT'S DRAWINGS. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO CONSTRUCTION.
- 1.4. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
- 1.5. ALL LEVELS IN METERS.
- 1.6. SIZES HEREON SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
- 1.7. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS & SPECIFICATIONS.

NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECT'S DETAILS.
2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT BRITISH STANDARDS, CODES OF PRACTICE, BUILDING REGULATIONS AND WITH SEWERS FOR ADOPTION 6TH EDITION GUIDANCE.
3. THE EXACT POSITION, 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. ALL UNCOVERED AND SHALLOW PIPEWORK TO BE PROTECTED AGAINST CONSTRUCTION TRAFFIC AS PART OF THE CONTRACTORS TEMPORARY WORKS REQUIREMENTS.
5. COVER LEVELS SHOWN ARE APPROXIMATE ONLY. SUBJECT TO THE ARCHITECT'S EXTERNAL WORKS AND LANDSCAPING SCHEME.
6. ALL CONNECTIONS TO ROAD GULLIES AND CHANNELS SHALL BE 150MM NOMINAL BORE PIPEWORK. CONNECTIONS TO RWPS TO BE 100MM NOMINAL BORE PIPEWORK. SUBJECT TO CONFIRMATION OF RWP SIZES AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW. CONNECTIONS TO FOUL TERMINAL FITTINGS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF ABOVE GROUND PIPE DIAMETERS AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW.
8. ALL PIPEWORK TO BE VITRIFIED CLAY UNLESS OTHERWISE NOTED.
9. ALL PIPES CONNECTING TO ADOPTED MANHOLES UP TO AND INCLUDING 300MM DIA. TO BE VITRIFIED CLAY.
10. ALL PIPES CONNECTING TO ADOPTED MANHOLES GREATER THAN 300MM DIA. TO BE CONCRETE.
11. ALL PIPEWORK ENTERING AND EXITING MANHOLES TO BE CONNECTED WITH PIPE SOFFITS LEVEL.
12. PRE-FORMED CHANNELS TO BE USED AT ALL MANHOLES.
13. HIGH STRENGTH CONCRETE BENCHING TO BE STEEL TROWELLED TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS AND LAID IN ACCORDANCE WITH THE SPECIFICATION.
14. PIPE BENDS TO BE PROVIDED TO SUIT DIRECTION OF FLOW.
15. ALL MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON HEAVY DUTY GRADE D400 DOUBLE TRIANGULAR TO BS EN 124 UNLESS OTHERWISE NOTED. COVERS TO BE LABELLED 'FW' AND 'SW' AS APPROPRIATE.
16. GULLY TOPS AND MANHOLE COVERS TO BE PROVIDED IN ACCORDANCE WITH BS EN 124.
17. ALL MANHOLE COVERS LOCATED INTERNALLY, TO BE RECESSED, DOUBLE SEAL, AIRTIGHT TYPE, ALUMINIUM OR STEEL, RECESS DEPTH TO ARCHITECT'S REQUIREMENTS TO SUIT FINISHES ETC.
18. ALL NEW DRAINAGE TO BE CONSTRUCTED ADJACENT NEW AND PROPOSED TREE PLANTING TO BE PROTECTED AGAINST ROOT ACTIVITY USING ROOT-CONTROL / ROOT BARRIER MATERIAL BY GREEN-TECH. ALL IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
19. FIRST FLEXIBLE JOINT IN PIPES ADJACENT TO A MANHOLE SHALL BE 600MM MAX. FROM INSIDE FACE OF MANHOLE. CONNECTING TO ROCKER PIPE, FOR PIPE DIAMETERS 150MM - 450MM THE ROCKER PIPE LENGTH SHALL BE 500MM - 750MM AND FOR PIPE DIAMETERS 451MM - 675MM THE ROCKER PIPE LENGTH SHALL BE 750MM - 1000MM.
20. MANHOLES WITH OUTGOING PIPES GREATER THAN 600MM DIA. SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER APPROVED SAFETY DEVICES.
21. WHERE THE FORMATION OF A PIPE TRENCH IS ABOVE ORIGINAL GROUND LEVEL, LEVELS ARE TO BE MADE UP WITH COMPACTED DTP TYPE 2 MATERIAL OR BETTER.
22. ALL PRIVATE DRIVES WHICH FALL TOWARDS A PUBLIC HIGHWAY AND EXCEED TWO PARKING BAYS IN AREA ARE TO BE PROVIDED WITH A SUITABLE GULLY OR DRAINAGE CHANNEL TO PREVENT WATER DISCHARGING ONTO THE HIGHWAY.
23. ALL BURIED CONCRETE MUST CATER FOR CLASS 2 SULPHATES CONDITIONS IN ACCORDANCE WITH TABLE 1 OF BRE DIGEST 363.
24. 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 1200MM COVER IN ROADS OR PRIVATE DRIVEWAYS USED BY COMMERCIAL VEHICLES. WHERE CONCRETE SURROUND IS SPECIFIED FLEXIBILITY OF JOINTS IS TO BE MAINTAINED BY USING COMPRESSIBLE BITUMEN IMPREGNATED FIBREBOARD AT EACH POINT.

P02	REVISED SITE LAYOUT	20.10.23	RCTS
P01	INITIAL ISSUE	20.10.23	RCTS
Rev.	Amendments	Date	By

 **iSTRUCT**
consultants ltd
Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

Client:
 **eG**
Euro Garages

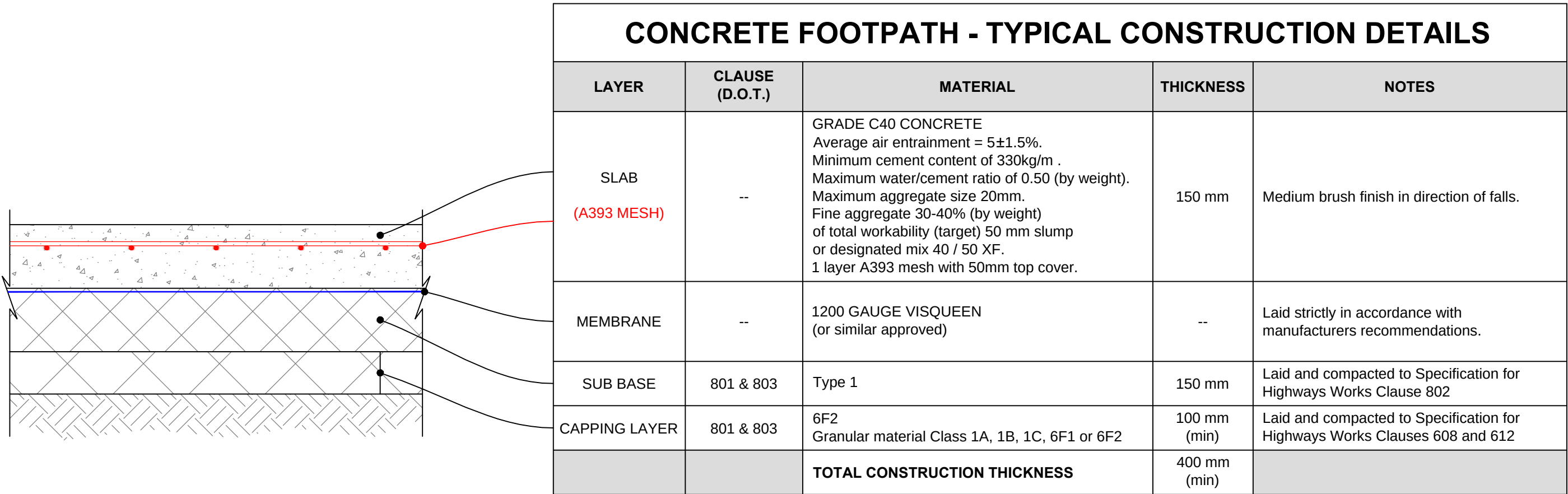
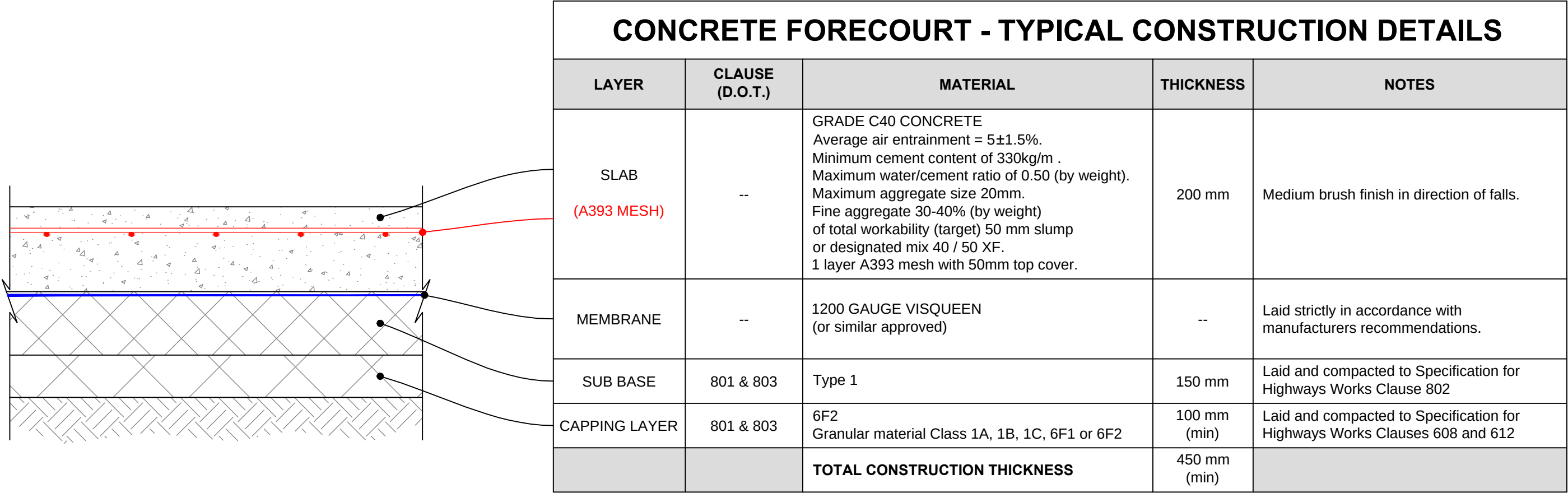
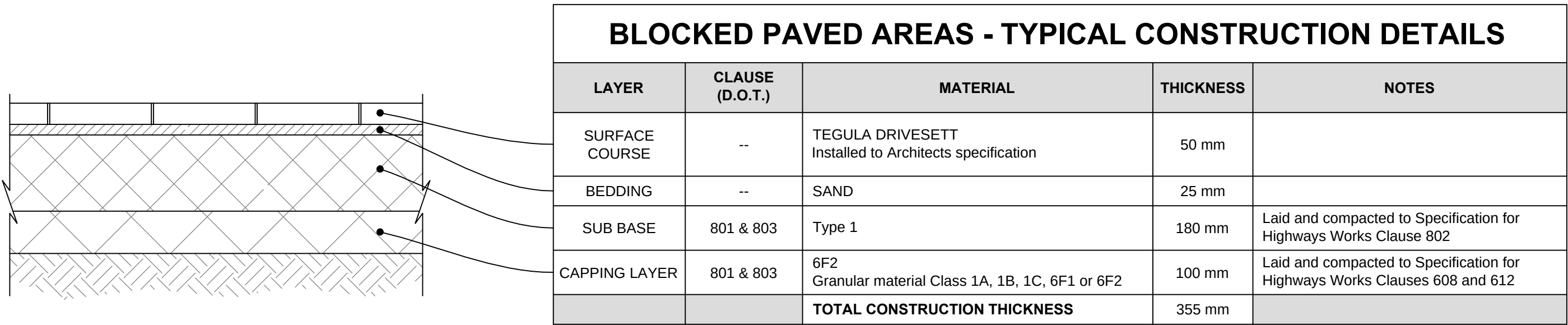
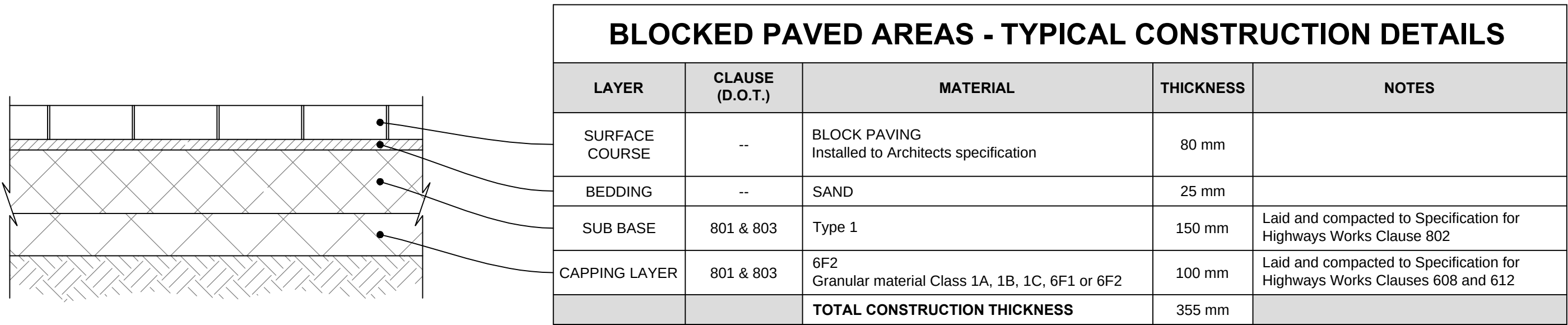
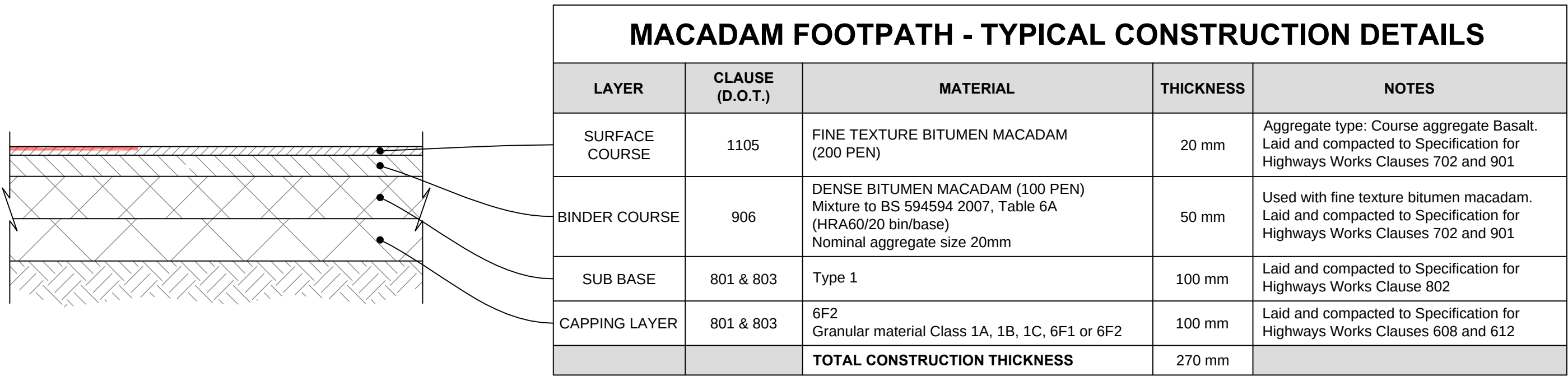
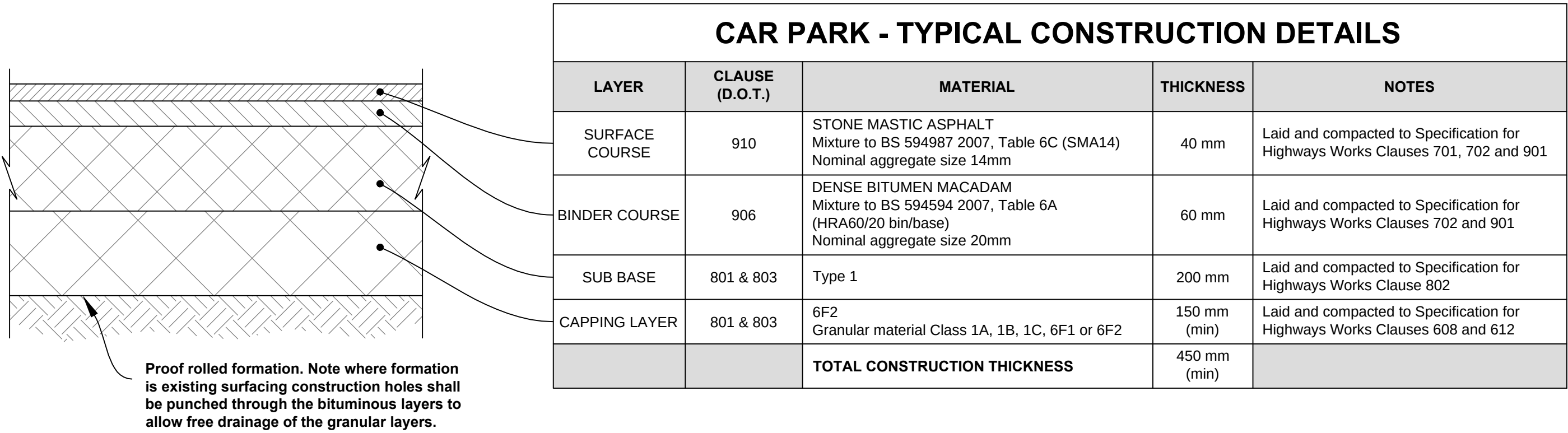
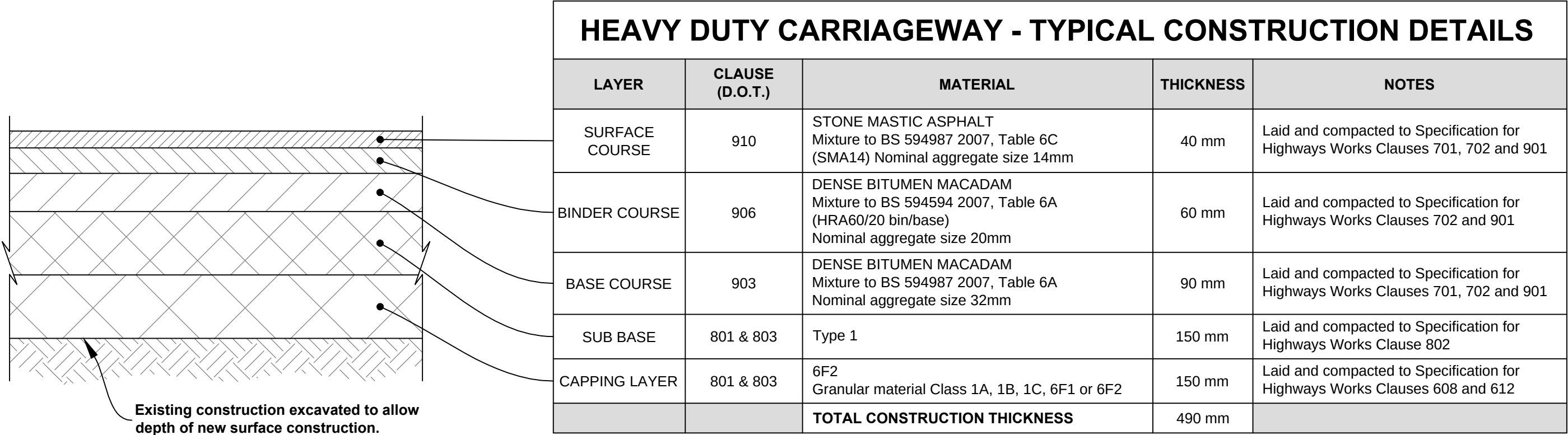
Project:
KINGSWAY, SIR ISAAC NEWTON WAY
ROCHDALE, OL16 4PS

Title:
EXCEEDANCE FLOW PLAN

At original size A1

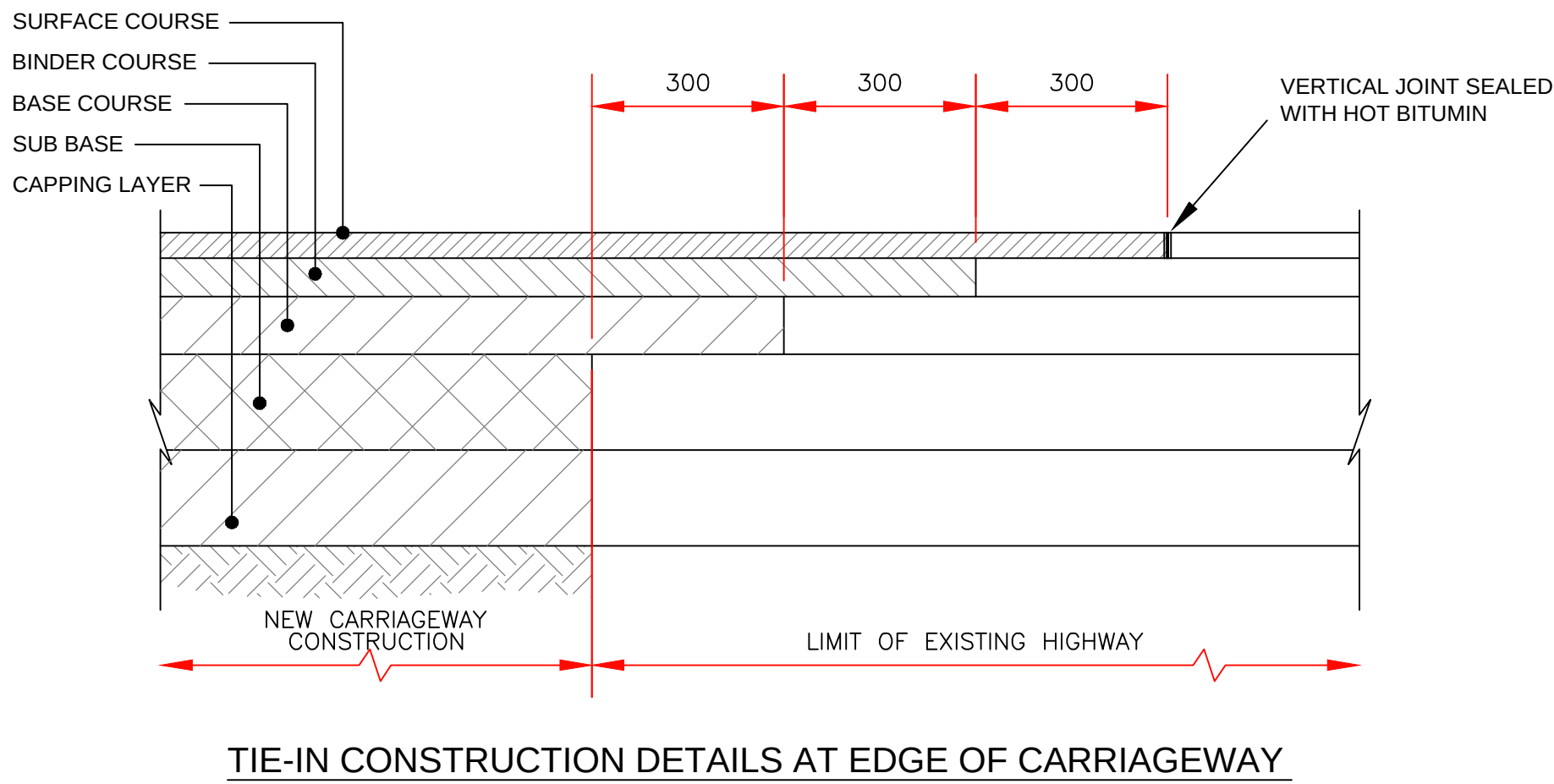
Status: **PRELIMINARY** Drawn By: RCTS Date: 20.10.2023 Scale: 1:250

Drawing No.: **LM23014-200** Rev: **P02**



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
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PLANNING			



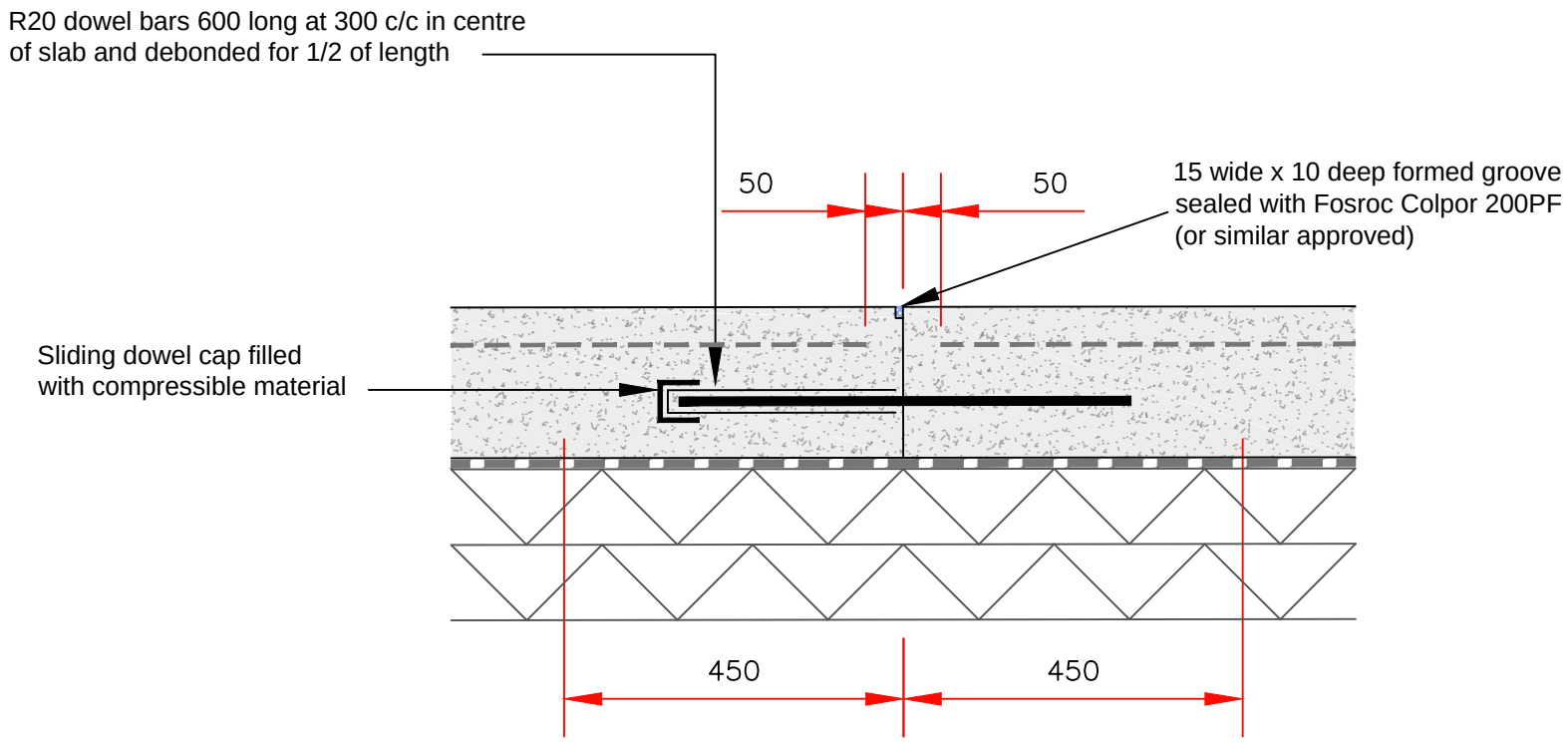
iSTRUCT
consultants Ltd

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

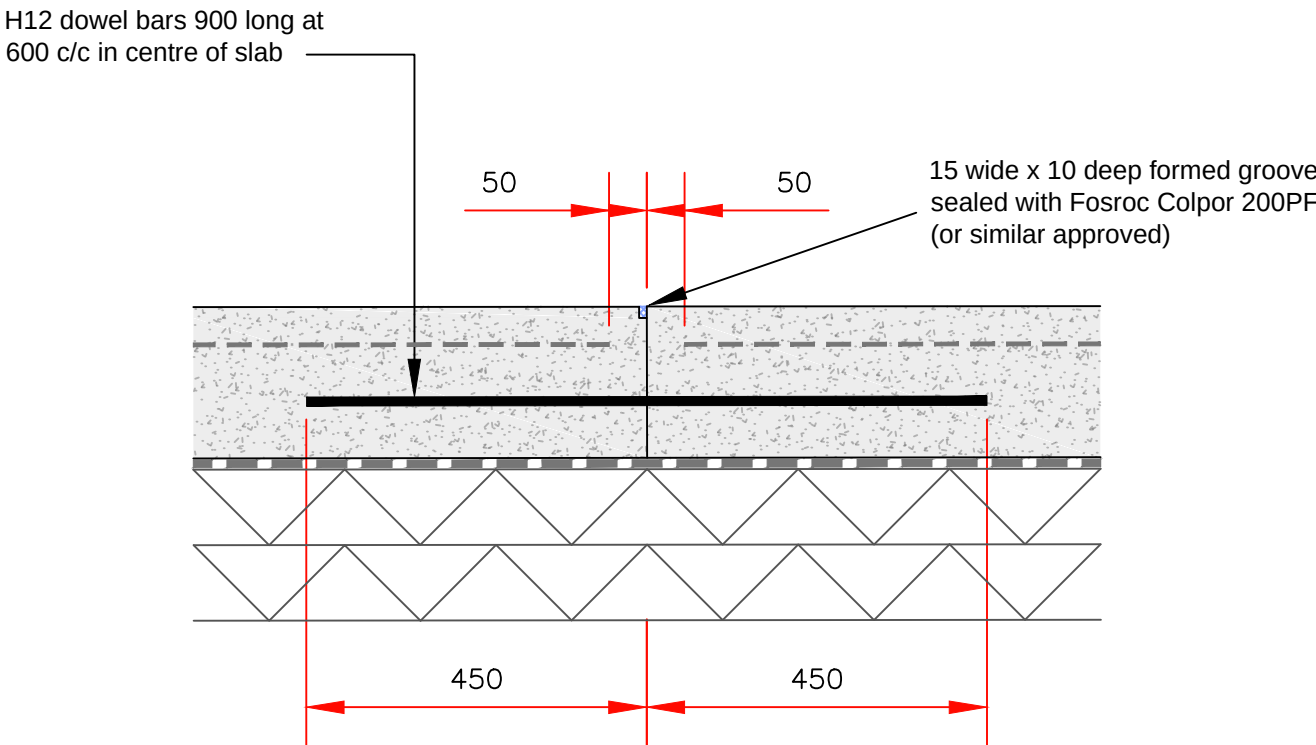


eG
Euro Garages

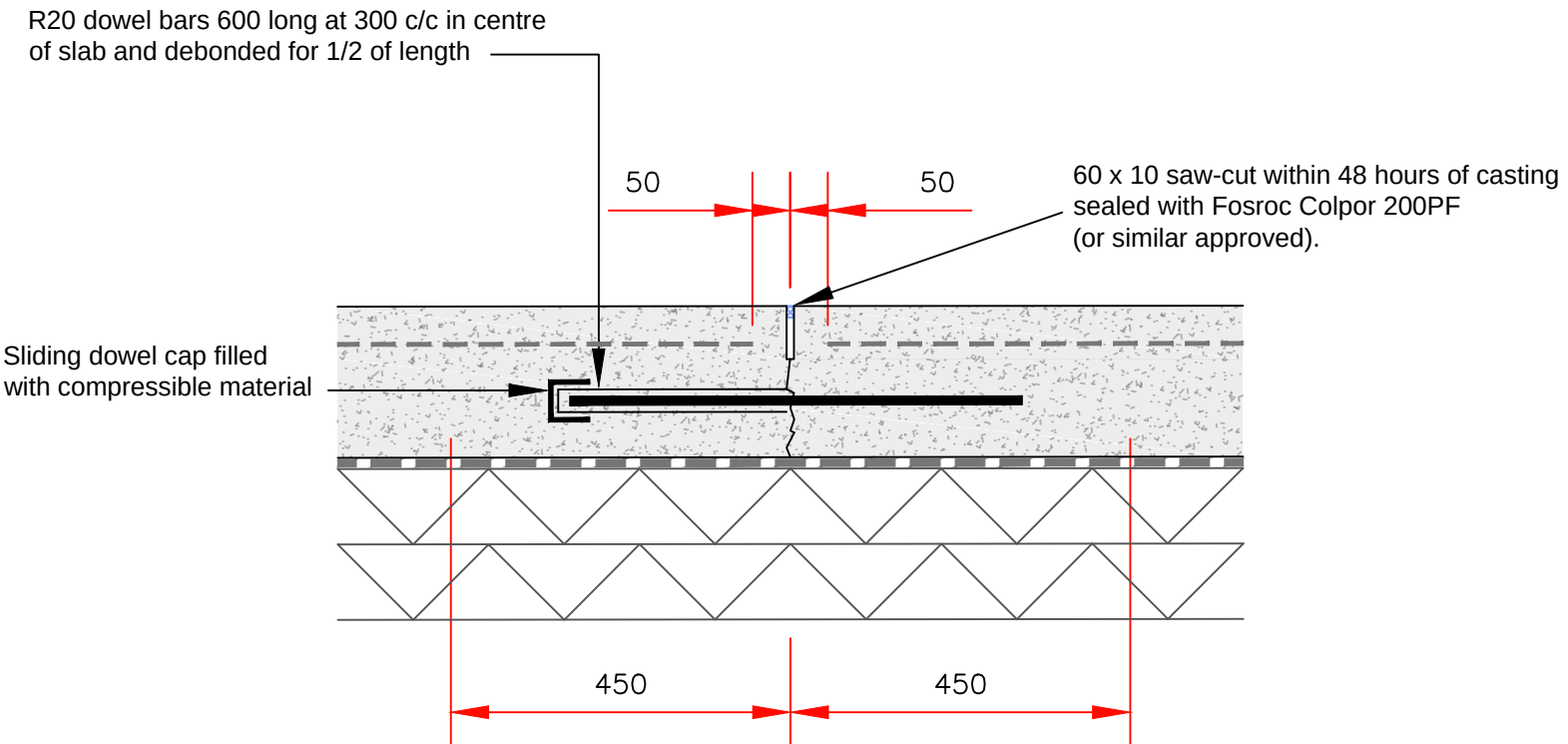
PROJECT: Proposed Development			
TITLE: Standard Details Surface Construction			
SCALE: AT A1: As Shown	DATE: APR 2022	DRAWN: YA	CHECKED: MM
PROJECT NO: IST	DRAWING NO: 001	REVISION: P1	



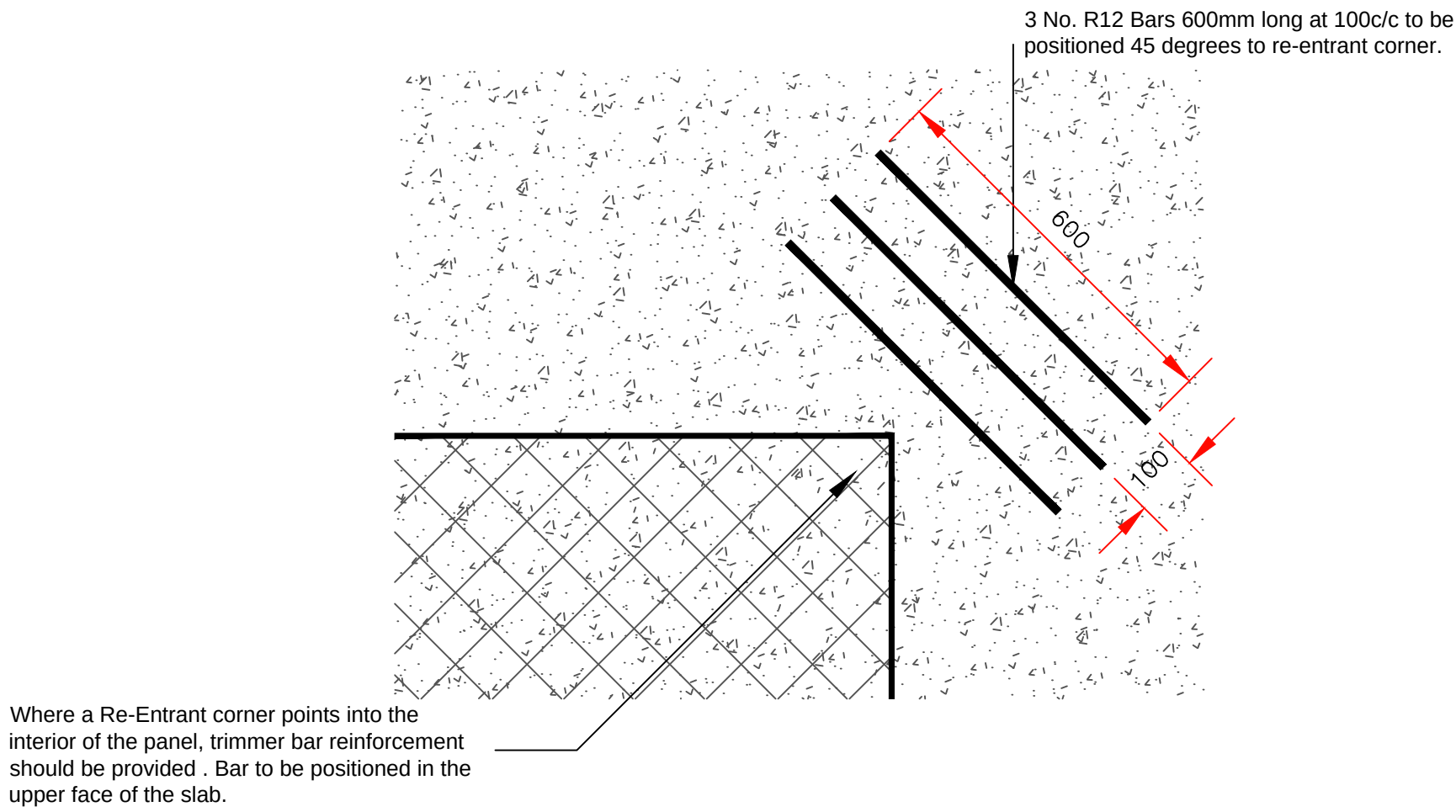
DEBONDED LONGITUDINAL JOINT (DLJ)



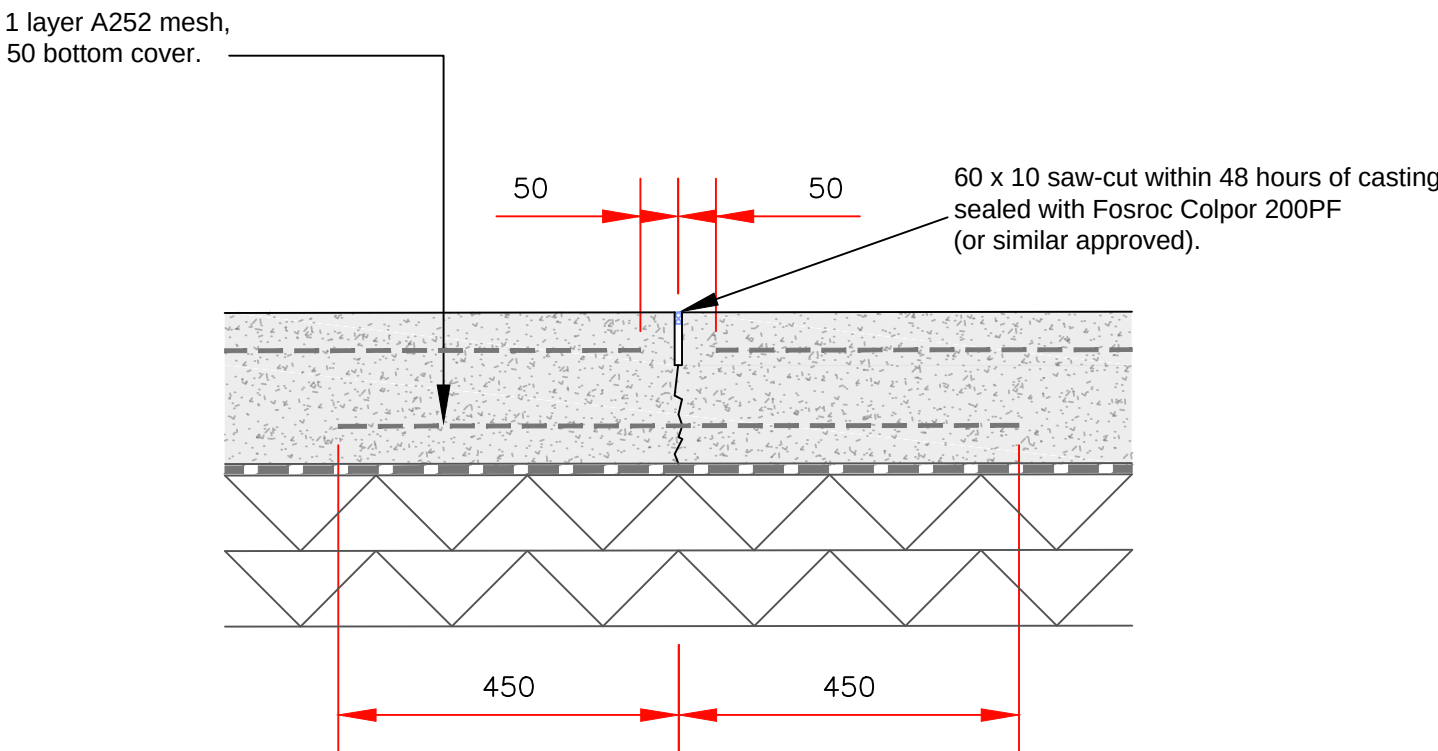
TIED LONGITUDINAL JOINT (TLJ)



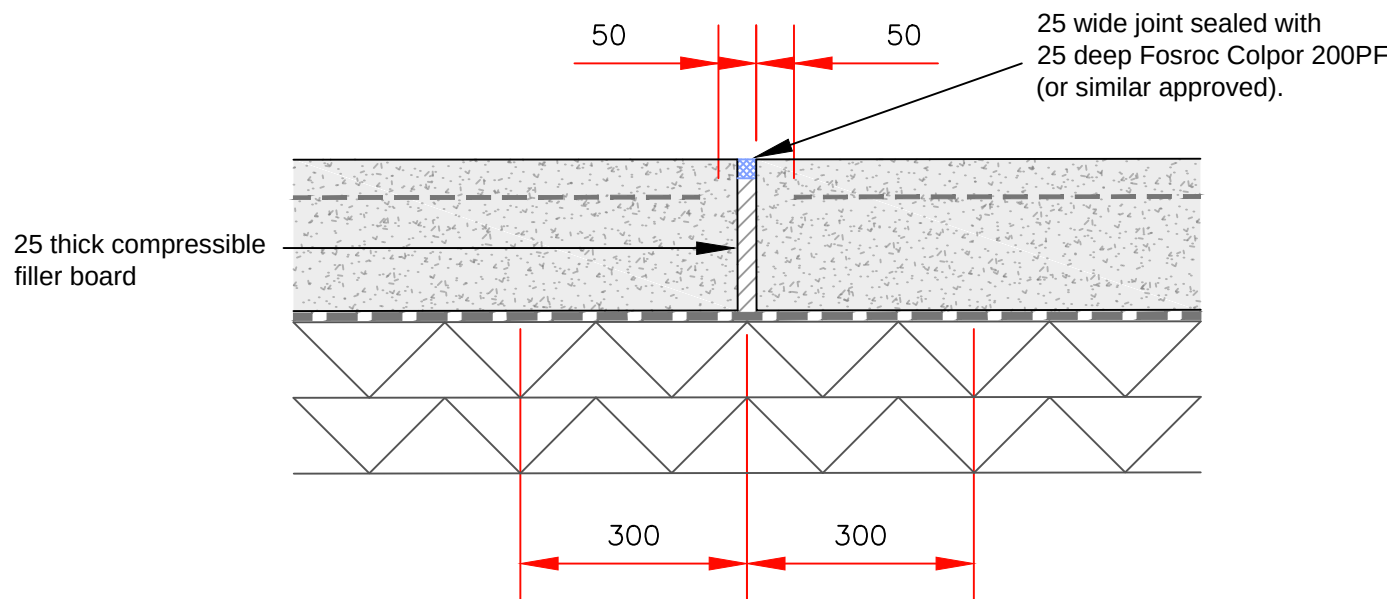
CONTRACTION JOINT (CJ)



TRIMMER BAR DETAIL FOR RE-ENTRANT CORNERS



INDUCED TIED JOINT (IJ)



ISOLATION JOINT (ISO)

P1	Standard Issue	YA	04/22
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PLANNING			



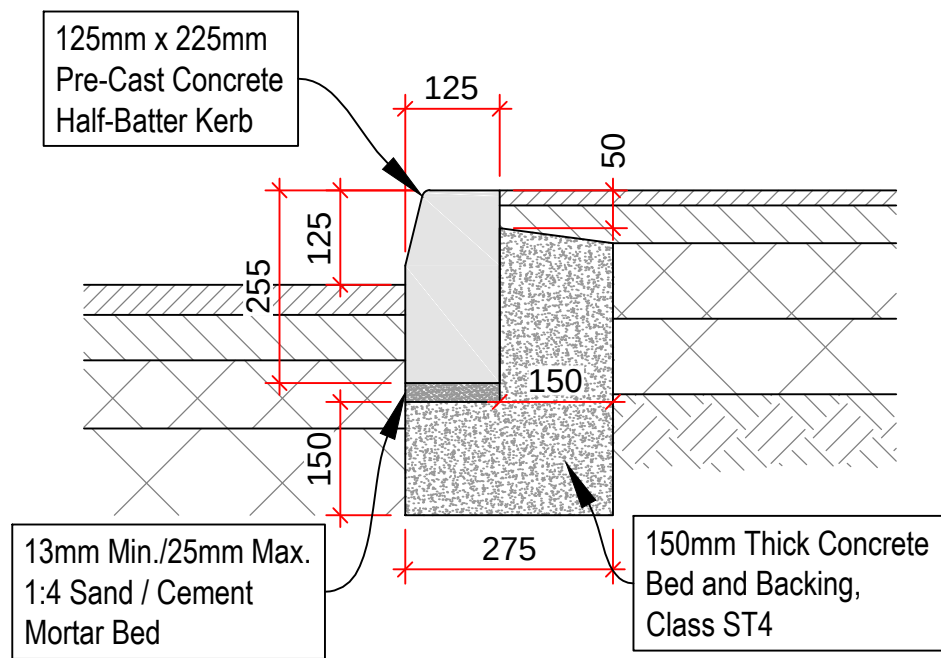
iSTRUCT
consultants ltd

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

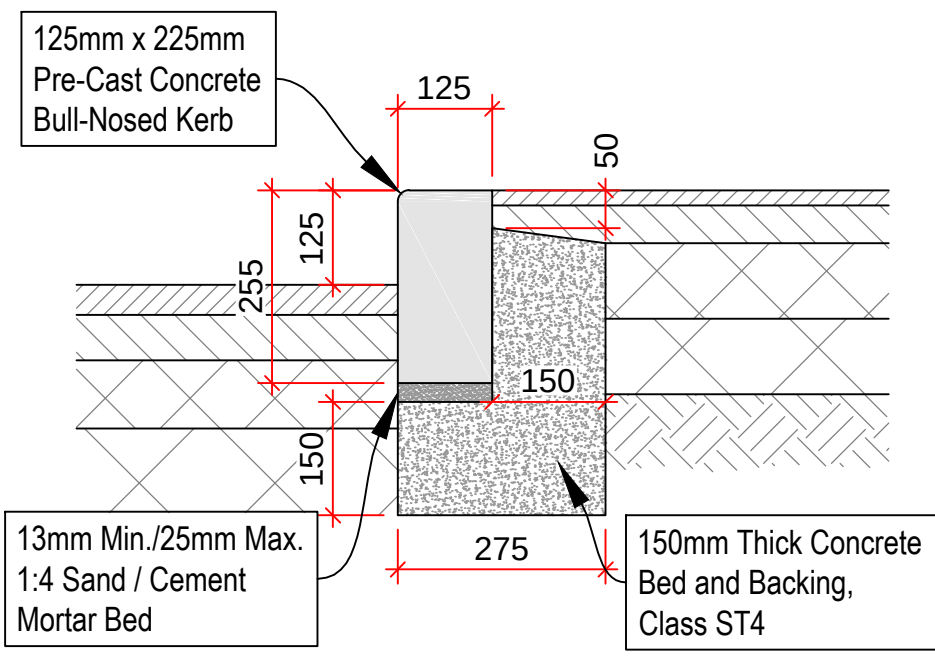
CLIENT:



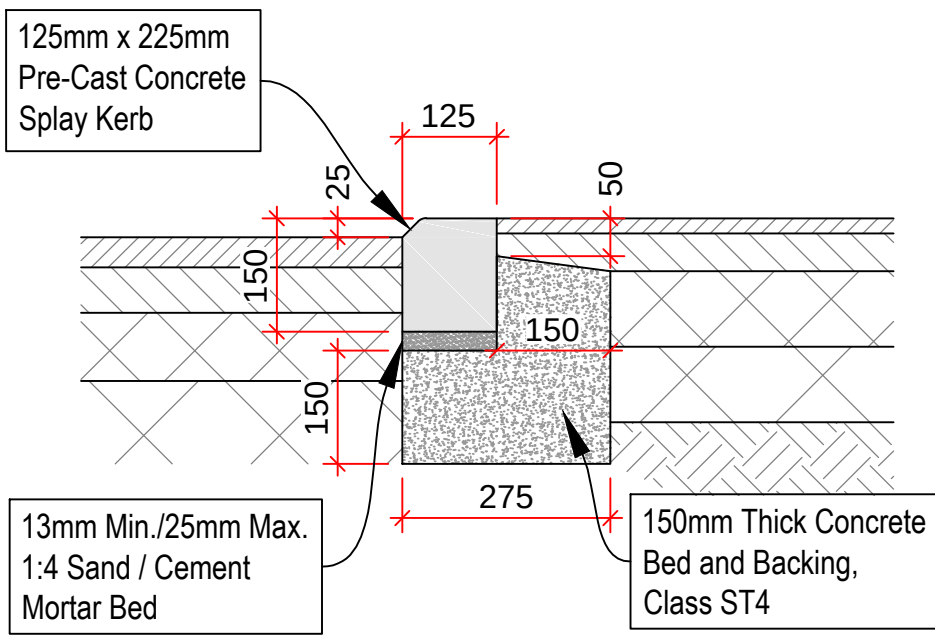
PROJECT: Proposed Development			
TITLE: Standard Details Construction Joints			
SCALE: AT A1: As Shown	DATE: APR 2022	DRAWN: YA	CHECKED: MM
PROJECT NO: IST	DRAWING NO: 002	REVISION: P1	



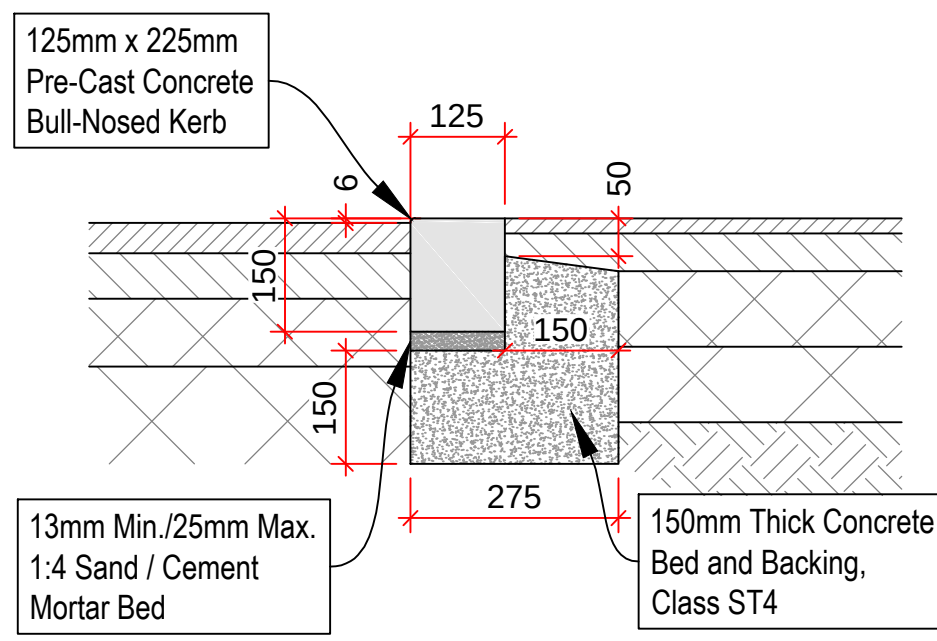
HALF-BATTER KERB - TYPICAL DETAIL



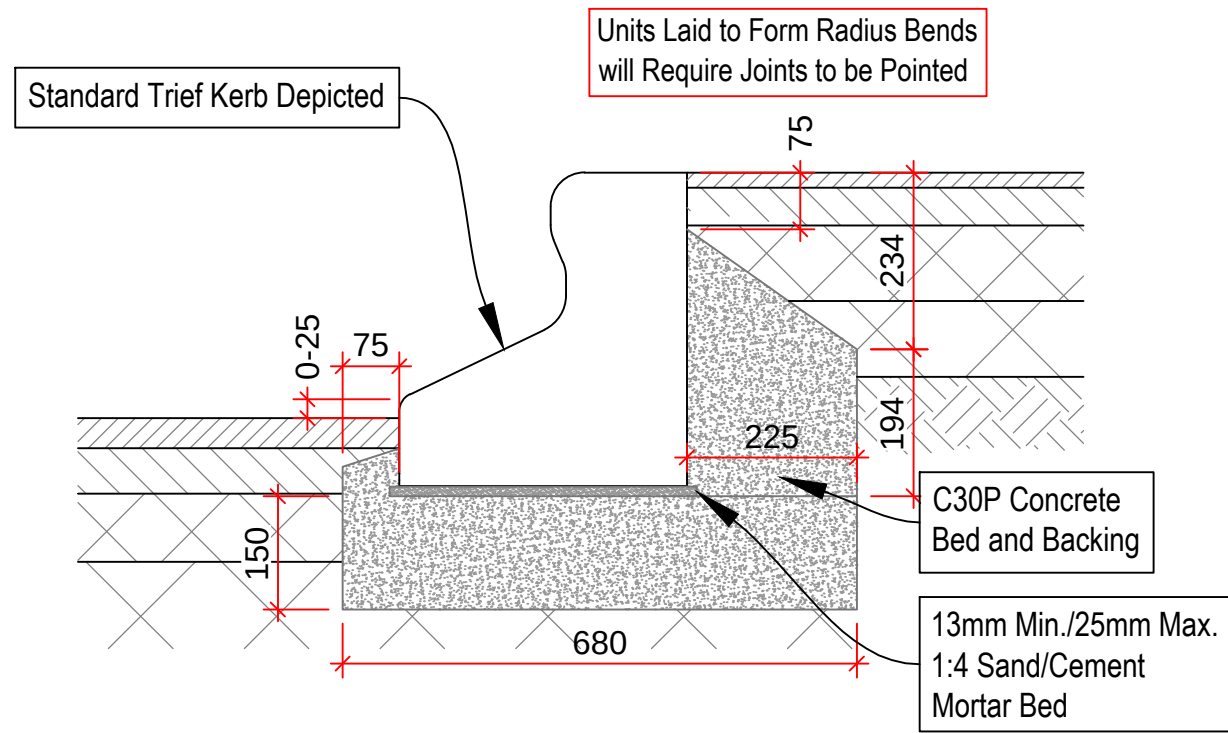
BULL-NOSE KERB - TYPICAL DETAIL



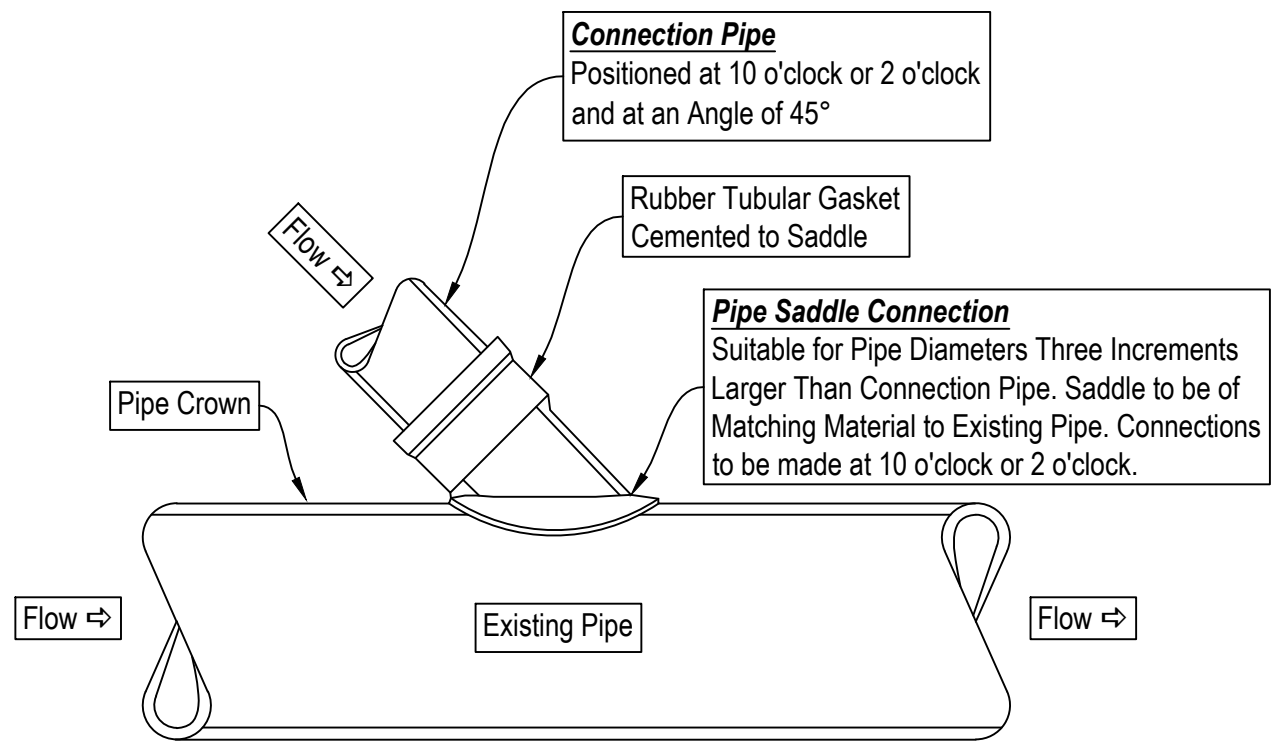
DROPPED KERB - TYPICAL DETAIL



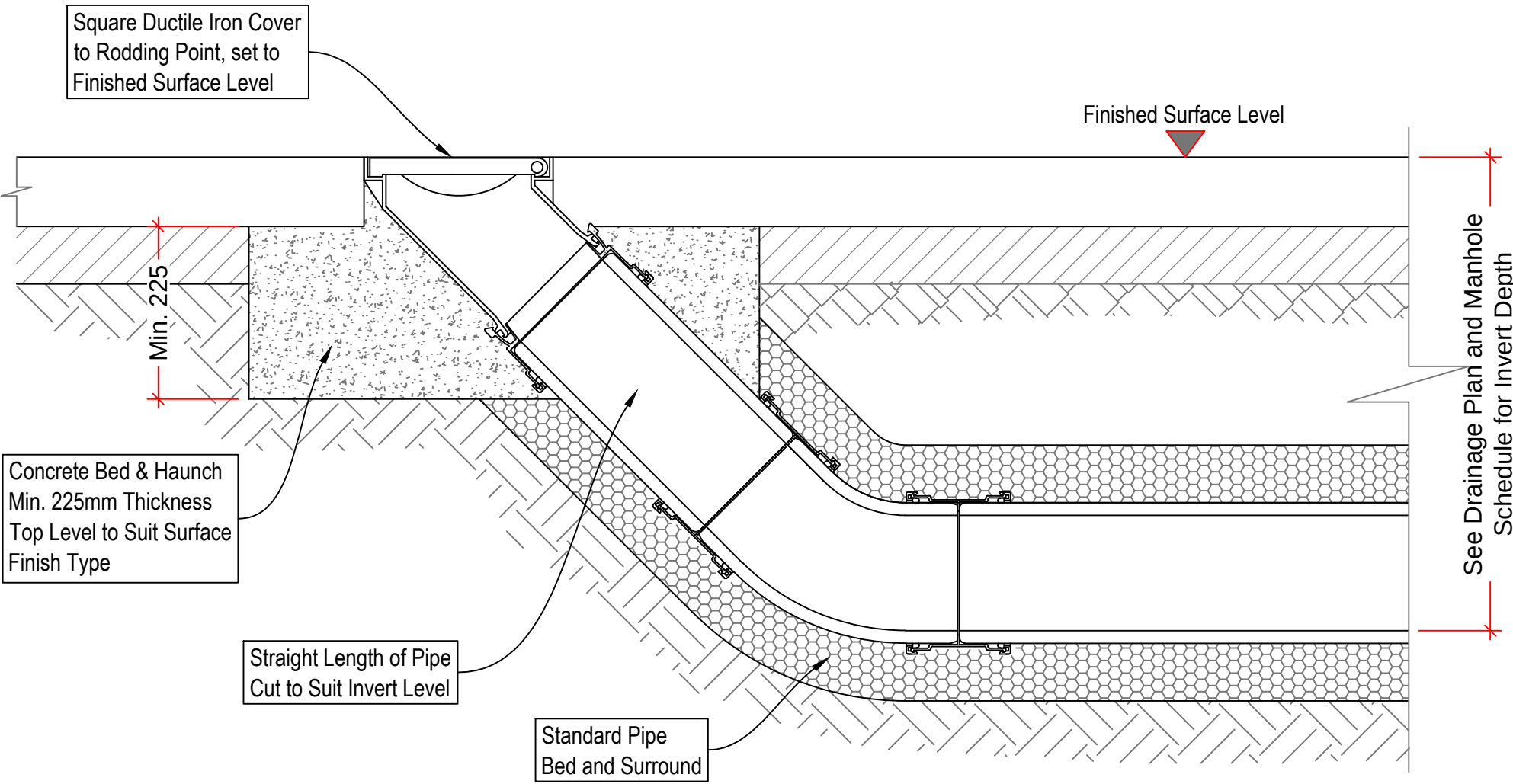
DROPPED KERB - TYPICAL DETAIL



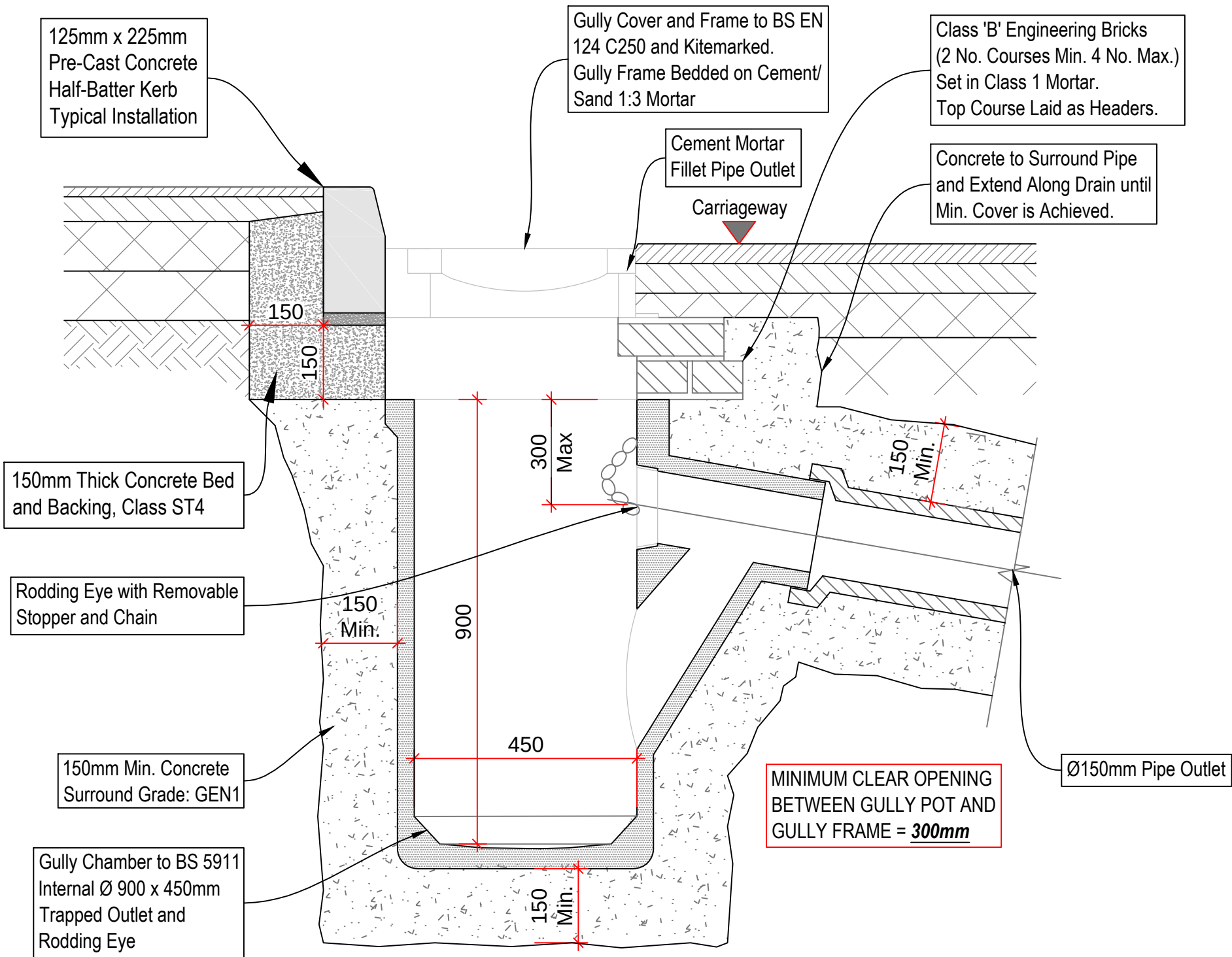
SAFETY KERB - TYPICAL DETAIL



SADDLE CONNECTION - TYPICAL DETAIL

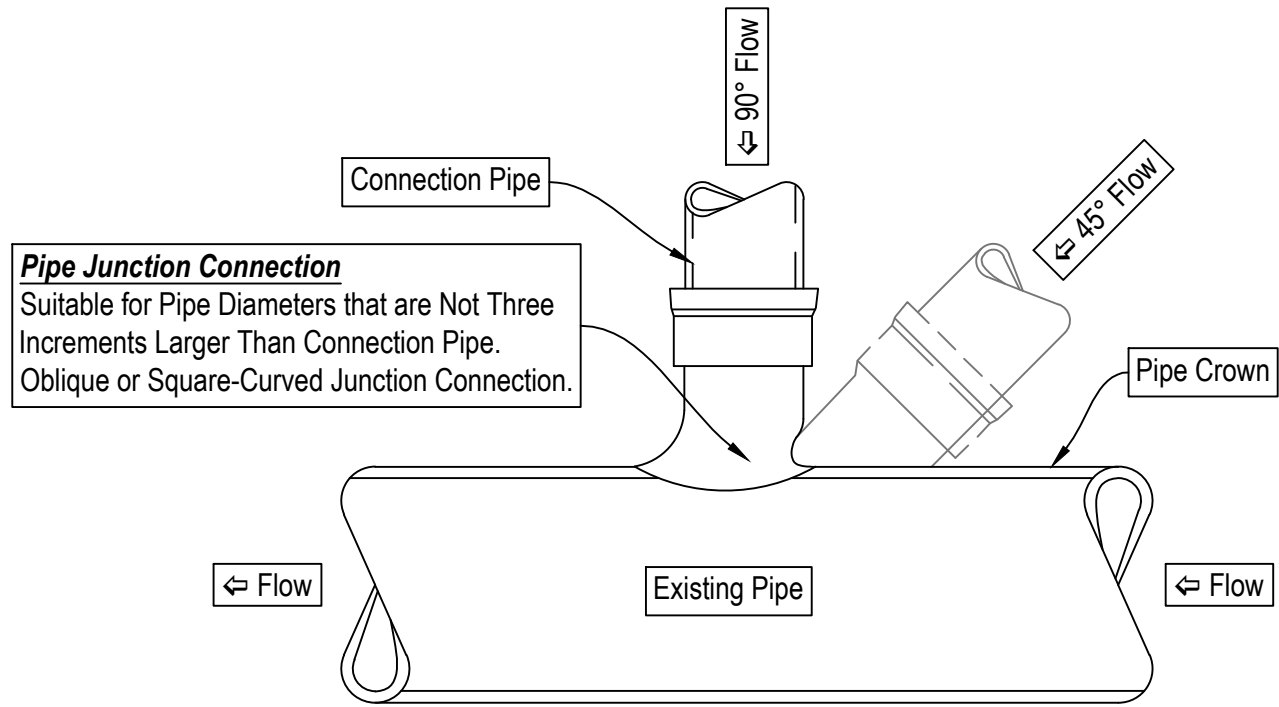


RODDING EYE - TYPICAL DETAIL

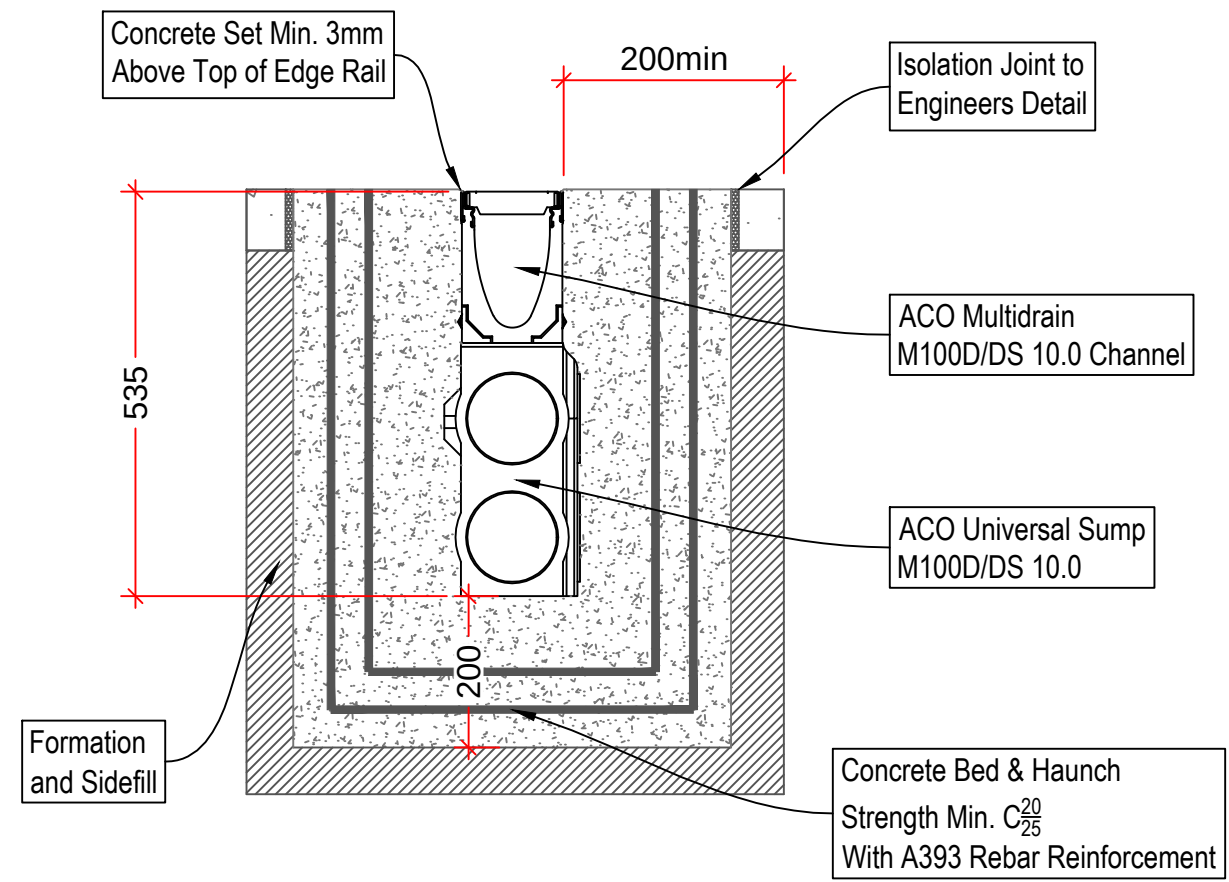


DRAINAGE GULLY - TYPICAL DETAIL

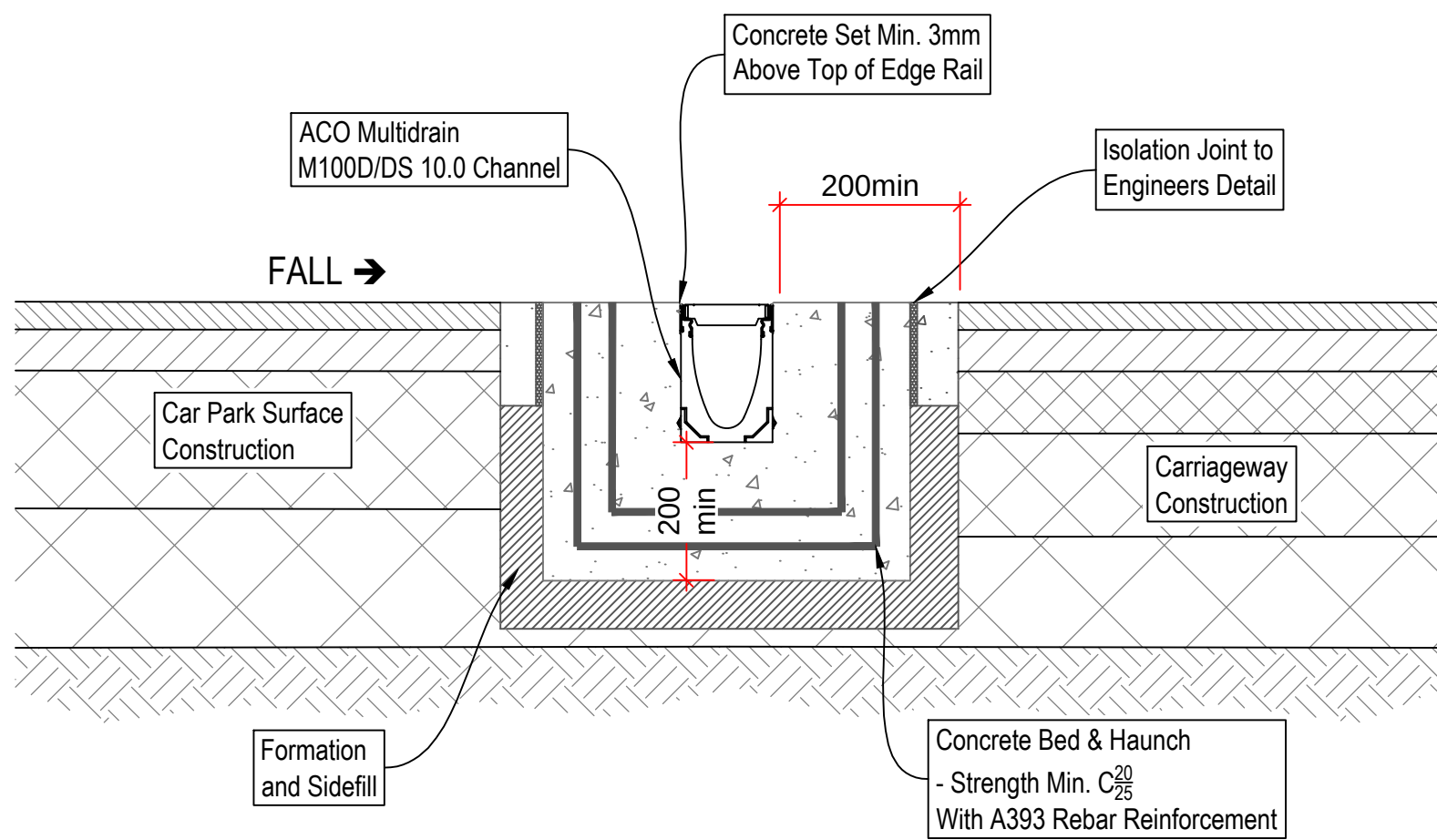
		EXISTING CONNECTION DIAMETER									
		100	150	225	300	375	450	525	600	675	750
PROPOSED CONNECTION Ø	100	Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	150		Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	225			Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	300				Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.
	375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



JUNCTION CONNECTION - TYPICAL DETAIL



CHANNEL DRAIN SUMP - TYPICAL DETAIL



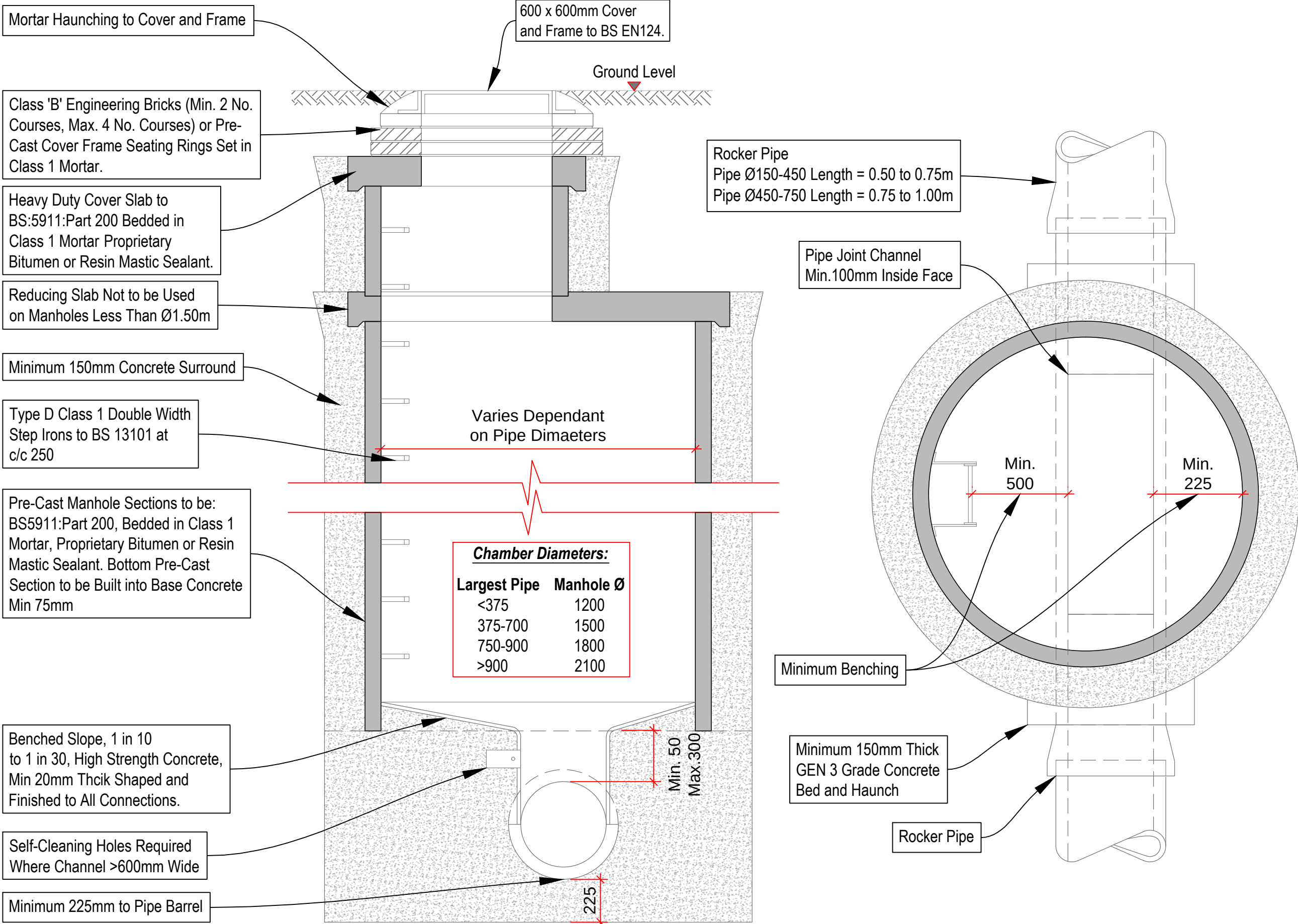
CHANNEL DRAIN - TYPICAL DETAIL

P1	Standard Issue	YA	04/22
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PLANNING			

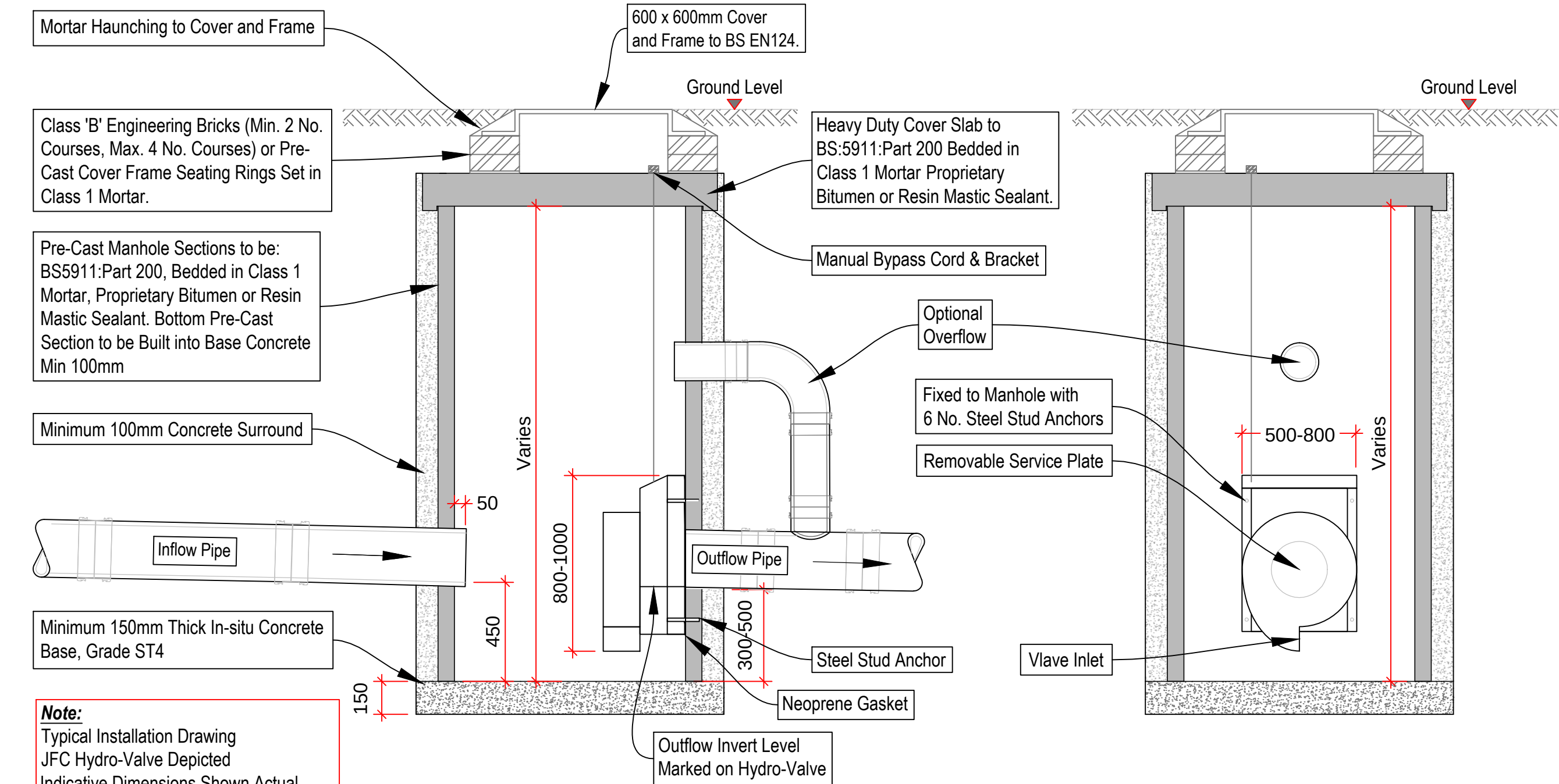
Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

CLIENT: Euro Garages

PROJECT: Proposed Development			
TITLE: Standard Details Drainage & External Details			
SCALE: AT A1: As Shown	DATE: APR 2022	DRAWN: YA	CHECKED: MM
PROJECT NO: IST	DRAWING NO: 003	REVISION: P1	

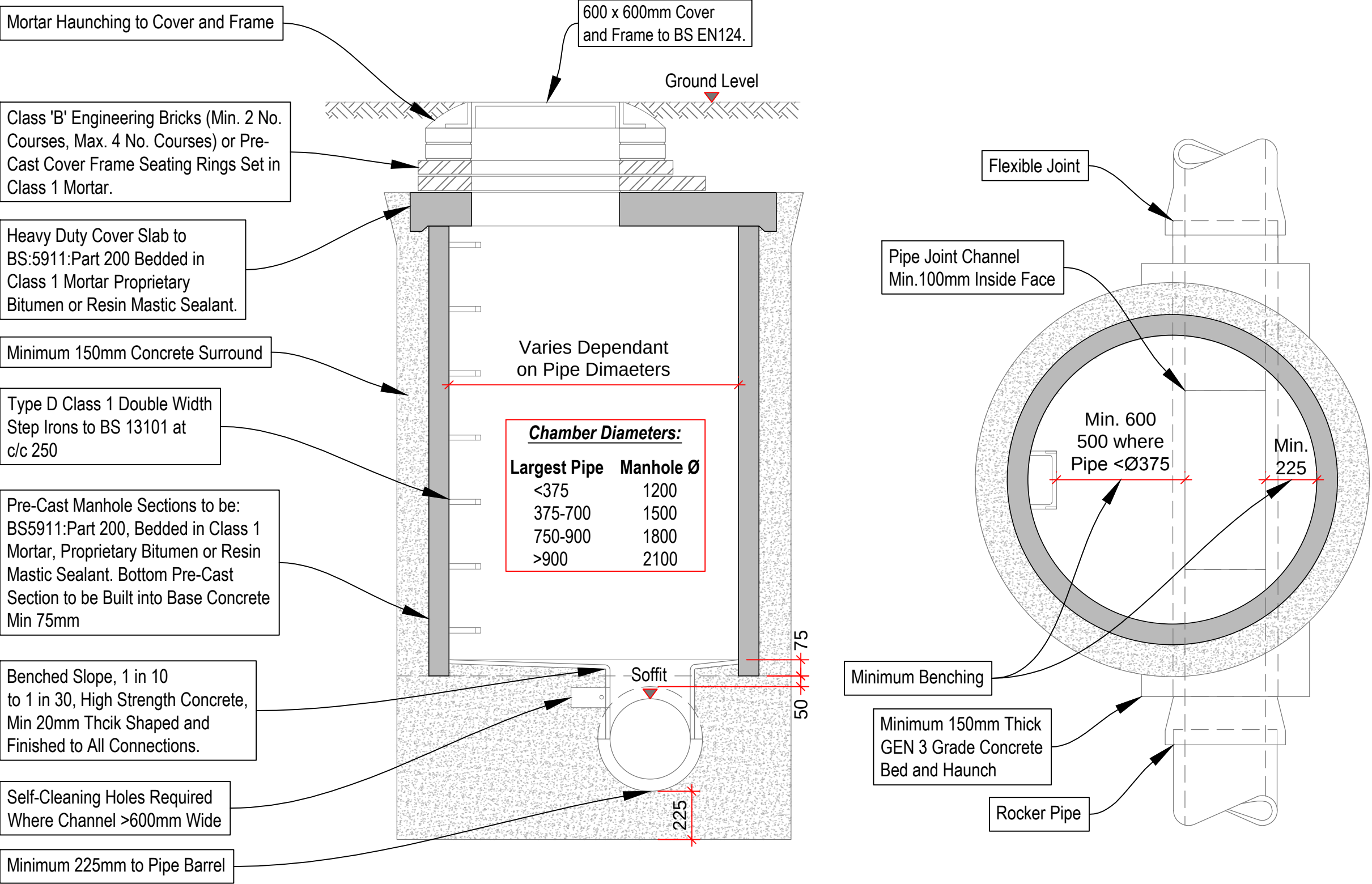


MANHOLE TYPE A - TYPICAL DETAILS



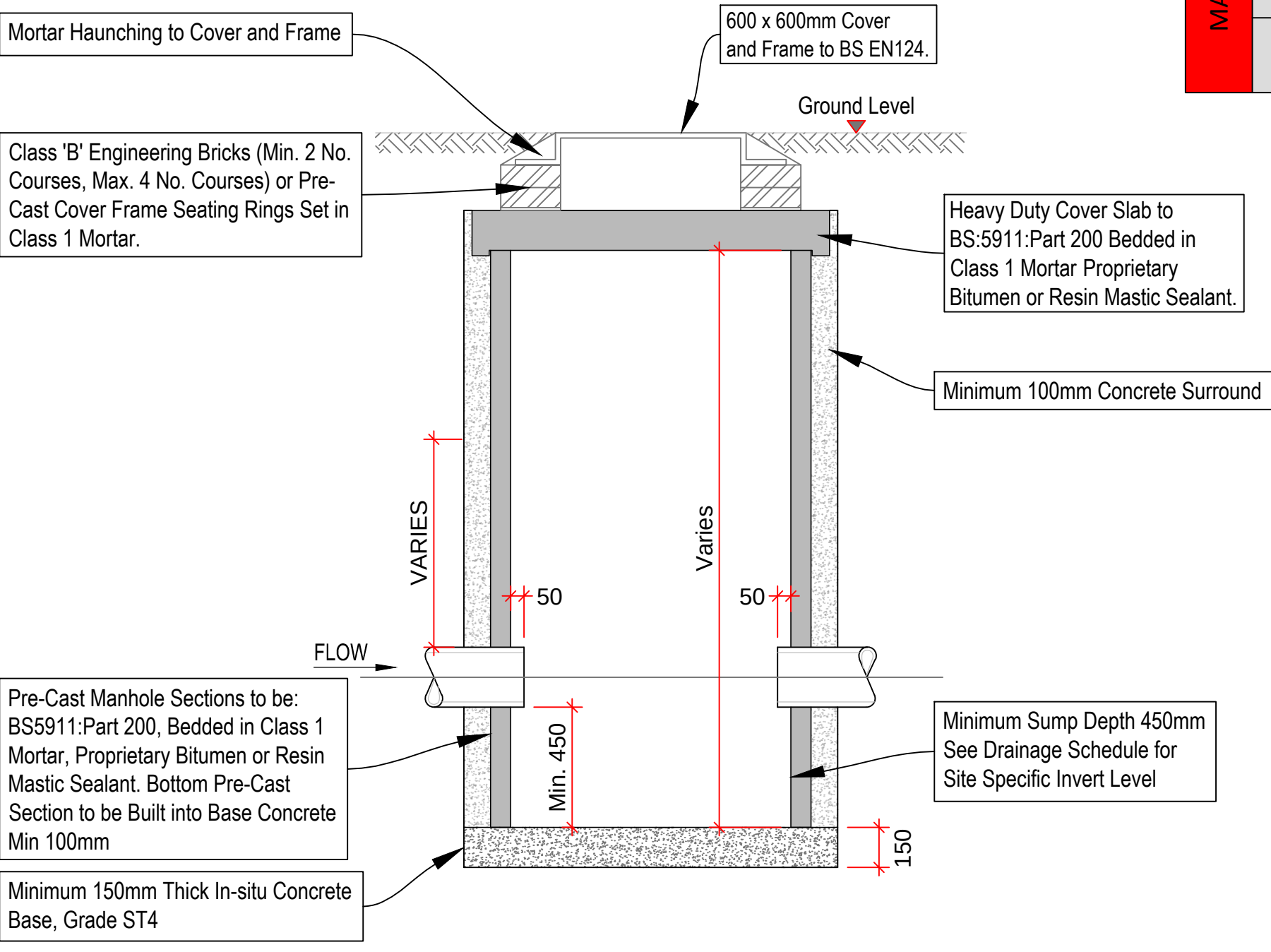
FLOW RESTRICTOR - TYPICAL SECTION DETAIL

FLOW RESTRICTOR - TYPICAL PROFILE DETAIL



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+
		>1000	SEE SCHEDULE
		STEPS	1050
	>3000	LADDERS	1200



CATCHPIT SECTION - TYPICAL DETAIL

P1

Standard Issue

YA

04/22

REV:

DESCRIPTION:

BY:

DATE:

STATUS:

PLANNING

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

CLIENT:

Proposed Development

SCALE: AT A1:
As Shown

DATE:
APR 2022

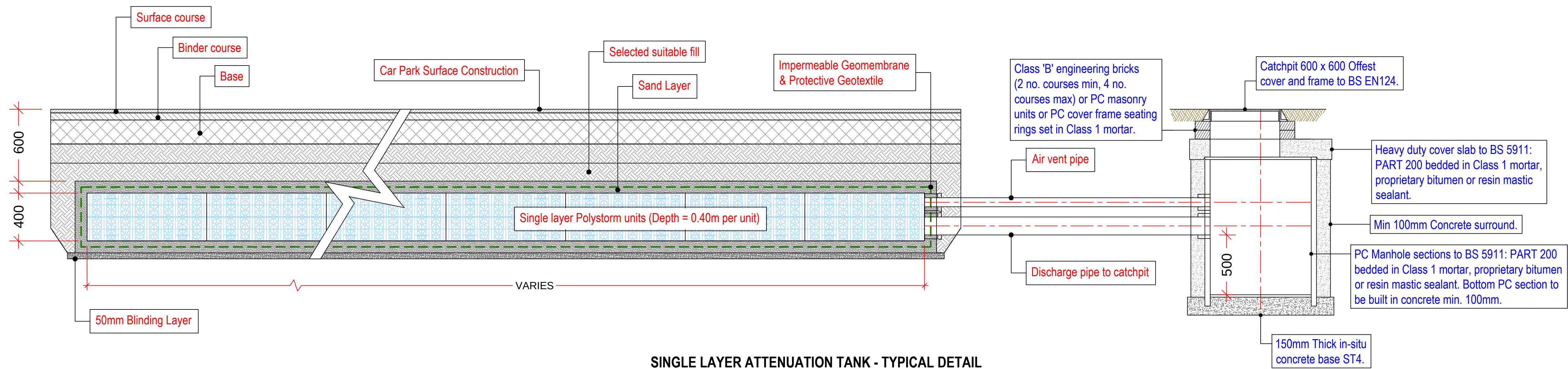
DRAWN:
YA

CHECKED:
MM

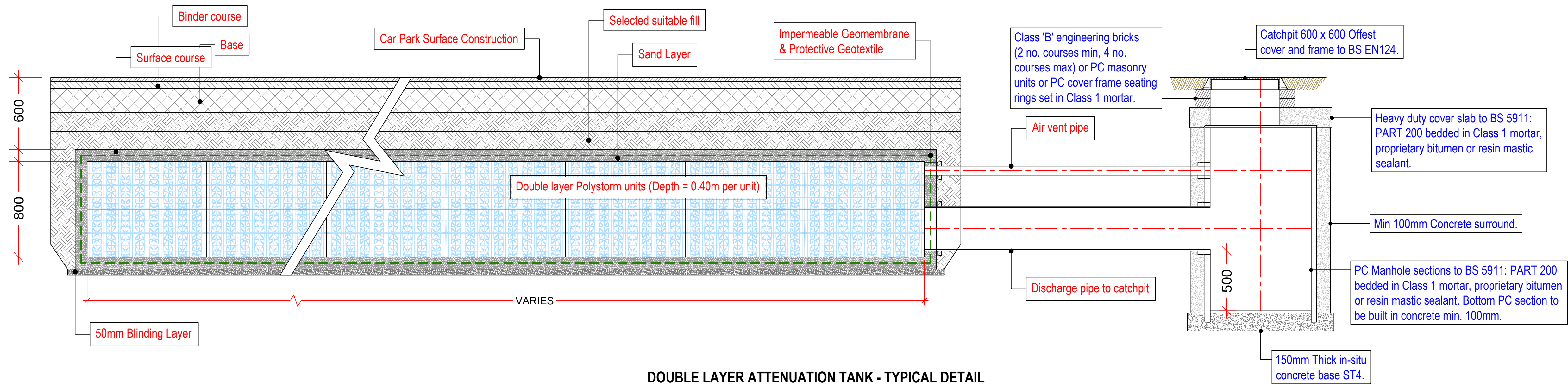
PROJECT NO:
IST

DRAWING NO:
004

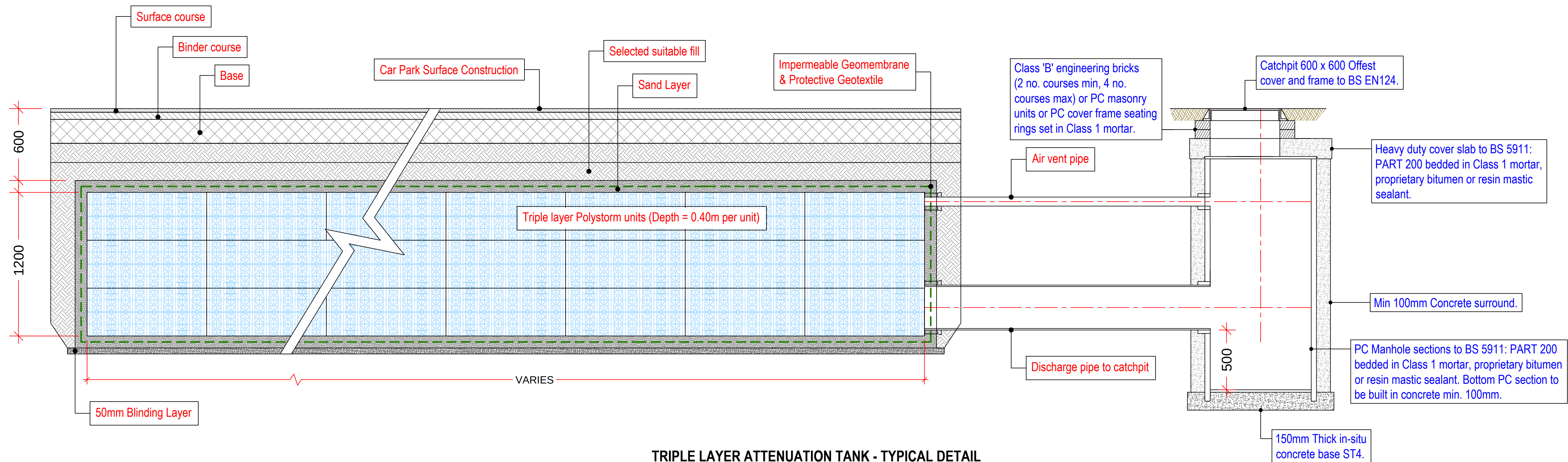
REVISION:
P1



SINGLE LAYER ATTENUATION TANK - TYPICAL DETAIL



DOUBLE LAYER ATTENUATION TANK - TYPICAL DETAIL



TRIPLE LAYER ATTENUATION TANK - TYPICAL DETAIL

P1	Standard Issue	YA	04/22
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PLANNING			
 iSTRUCT consultants Ltd Suite E - AA Business Centre, 336-340 Dunstable Road, Luton, Bedfordshire, LU4 8JS Tel: 01582 455738 Email: info@istructconsultants.com			
CLIENT: 			
PROJECT: Proposed Development			
TITLE: Standard Details Attenuation Storage			
SCALE: AT A1: As Shown	DATE: APR 2022	DRAWN: YA	CHECKED: MM
PROJECT NO: IST	DRAWING NO: 005	REVISION: P1	

Appendix C

Discharge Rate Estimation (Greenfield runoff rate)

Hydraulic Modelling Calculations



Calculated by: Kwaku Tano-Yeboah

Site name: Sir Isaac Newton Way

Site location: Rochdale

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude: 53.60431° N

Longitude: 2.12784° W

Reference: 1609581337

Date: Oct 20 2023 22:05

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.39

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	1	1
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.1

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	1160	1160
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default Edited

Q_{BAR} (l/s):	0.42	0.42
1 in 1 year (l/s):	0.37	0.37
1 in 30 years (l/s):	0.72	0.72
1 in 100 year (l/s):	0.88	0.88
1 in 200 years (l/s):	1	1

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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)	1.200
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)
S1	0.080	5.00	146.200	600	391297.921	412263.639	1.425
S2	0.061	5.00	146.300	600	391263.995	412271.787	1.816
S3	0.037	5.00	146.200	1200	391242.328	412268.968	1.847
S4			146.200	1200	391234.847	412277.983	1.917
S5	0.052	5.00	146.500	1200	391241.788	412306.089	2.532
S6	0.056	5.00	146.500	1200	391245.089	412319.460	2.694
S7-FCC	0.023	5.00	146.680	1200	391243.364	412342.843	3.343
S8	0.060	5.00	146.350	600	391308.160	412290.104	1.350
S9	0.075	5.00	146.300	600	391274.258	412300.239	1.890
S10			146.400	1200	391269.303	412312.464	2.210
S11	0.027	5.00	146.850	600	391188.176	412279.952	1.350
S12	0.027	5.00	146.850	600	391208.257	412274.518	1.558
S13			146.750	1200	391218.875	412295.590	1.938
S14	0.090	5.00	146.700	1200	391226.360	412309.899	2.275
S15	0.055	5.00	146.800	600	391183.291	412304.158	1.350
S17	0.037	5.00	146.750	600	391194.533	412318.909	1.500
S18	0.041	5.00	146.650	600	391193.088	412346.178	1.350
S19	0.025	5.00	146.450	600	391228.868	412335.604	1.647
S20	0.025	5.00	146.400	600	391230.329	412323.835	1.755
SMH-Ex			146.300	1200	391246.881	412355.993	3.343

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	S1	S2	34.891	0.600	144.775	144.484	0.291	120.0	225	5.49	45.6
1.001	S2	S3	21.850	0.600	144.484	144.353	0.131	167.0	225	5.85	44.4
1.002	S3	S4	11.715	0.600	144.353	144.283	0.070	167.0	225	6.04	43.8
1.003	S4	S5	28.950	0.600	144.283	143.993	0.290	100.0	225	6.41	42.7
1.004	S5	S6	13.772	0.600	143.968	143.806	0.162	85.0	250	6.56	42.3
2.000	S8	S9	35.385	0.600	145.000	144.410	0.590	60.0	225	5.35	46.1

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	1.192	47.4	9.9	1.200	1.591	0.080	0.0	70	0.949
1.001	1.009	40.1	17.0	1.591	1.622	0.141	0.0	102	0.969
1.002	1.009	40.1	21.1	1.622	1.692	0.178	0.0	116	1.023
1.003	1.307	52.0	20.6	1.692	2.282	0.178	0.0	98	1.231
1.004	1.518	74.5	63.8	2.282	2.444	0.557	0.0	178	1.698
2.000	1.691	67.2	7.5	1.125	1.665	0.060	0.0	51	1.125

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)
2.001	S9	S10	13.191	0.600	144.410	144.190	0.220	60.0	225	5.48	45.6
2.002	S10	S6	25.204	0.600	144.190	144.042	0.148	170.0	225	5.90	44.2
3.000	S11	S12	20.803	0.600	145.500	145.292	0.208	100.0	150	5.35	46.1
3.001	S12	S13	23.596	0.600	145.292	144.929	0.363	65.0	150	5.66	45.0
4.000	S15	S13	36.601	0.600	145.450	144.887	0.563	65.0	150	5.49	45.6
3.002	S13	S14	16.148	0.600	144.812	144.489	0.323	50.0	225	5.81	44.5
5.000	S17	S14	33.078	0.600	145.250	144.515	0.735	45.0	150	5.37	46.0
6.000	S18	S19	37.310	0.600	145.300	144.803	0.497	75.0	150	5.54	45.4
6.001	S19	S20	11.859	0.600	144.803	144.645	0.158	75.0	150	5.71	44.9
6.002	S20	S14	14.490	0.600	144.645	144.500	0.145	100.0	150	5.95	44.1
3.003	S14	S5	15.891	0.600	144.425	144.107	0.318	50.0	225	6.09	43.7
1.005	S6	S7-FCC	23.447	0.600	143.806	143.337	0.469	50.0	250	6.76	41.7
1.006	S7-FCC	SMH-Ex	13.612	0.600	143.337	142.957	0.380	35.8	250	6.86	41.4

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)
2.001	1.691	67.2	16.7	1.665	1.985	0.135	0.0	76	1.408
2.002	1.000	39.7	16.2	1.985	2.233	0.135	0.0	100	0.949
3.000	1.005	17.8	3.4	1.200	1.408	0.027	0.0	44	0.774
3.001	1.249	22.1	6.6	1.408	1.671	0.054	0.0	56	1.091
4.000	1.249	22.1	6.8	1.200	1.713	0.055	0.0	57	1.102
3.002	1.854	73.7	13.2	1.713	1.986	0.109	0.0	64	1.405
5.000	1.504	26.6	4.6	1.350	2.035	0.037	0.0	42	1.135
6.000	1.162	20.5	5.0	1.200	1.497	0.041	0.0	51	0.964
6.001	1.162	20.5	8.0	1.497	1.605	0.066	0.0	65	1.093
6.002	1.005	17.8	10.9	1.605	2.050	0.091	0.0	85	1.053
3.003	1.854	73.7	38.7	2.050	2.168	0.327	0.0	116	1.874
1.005	1.984	97.4	84.6	2.444	3.093	0.748	0.0	181	2.225
1.006	2.346	115.1	86.6	3.093	3.093	0.771	0.0	163	2.569

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	34.891	120.0	225	Circular	146.200	144.775	1.200	146.300	144.484	1.591
1.001	21.850	167.0	225	Circular	146.300	144.484	1.591	146.200	144.353	1.622
1.002	11.715	167.0	225	Circular	146.200	144.353	1.622	146.200	144.283	1.692
1.003	28.950	100.0	225	Circular	146.200	144.283	1.692	146.500	143.993	2.282
1.004	13.772	85.0	250	Circular	146.500	143.968	2.282	146.500	143.806	2.444
2.000	35.385	60.0	225	Circular	146.350	145.000	1.125	146.300	144.410	1.665
2.001	13.191	60.0	225	Circular	146.300	144.410	1.665	146.400	144.190	1.985

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable
1.001	S2	600	Manhole	Adoptable	S3	1200	Manhole	Adoptable
1.002	S3	1200	Manhole	Adoptable	S4	1200	Manhole	Adoptable
1.003	S4	1200	Manhole	Adoptable	S5	1200	Manhole	Adoptable
1.004	S5	1200	Manhole	Adoptable	S6	1200	Manhole	Adoptable
2.000	S8	600	Manhole	Adoptable	S9	600	Manhole	Adoptable
2.001	S9	600	Manhole	Adoptable	S10	1200	Manhole	Adoptable

Pipeline Schedule

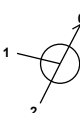
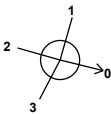
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.002	25.204	170.0	225	Circular	146.400	144.190	1.985	146.500	144.042	2.233
3.000	20.803	100.0	150	Circular	146.850	145.500	1.200	146.850	145.292	1.408
3.001	23.596	65.0	150	Circular	146.850	145.292	1.408	146.750	144.929	1.671
4.000	36.601	65.0	150	Circular	146.800	145.450	1.200	146.750	144.887	1.713
3.002	16.148	50.0	225	Circular	146.750	144.812	1.713	146.700	144.489	1.986
5.000	33.078	45.0	150	Circular	146.750	145.250	1.350	146.700	144.515	2.035
6.000	37.310	75.0	150	Circular	146.650	145.300	1.200	146.450	144.803	1.497
6.001	11.859	75.0	150	Circular	146.450	144.803	1.497	146.400	144.645	1.605
6.002	14.490	100.0	150	Circular	146.400	144.645	1.605	146.700	144.500	2.050
3.003	15.891	50.0	225	Circular	146.700	144.425	2.050	146.500	144.107	2.168
1.005	23.447	50.0	250	Circular	146.500	143.806	2.444	146.680	143.337	3.093
1.006	13.612	35.8	250	Circular	146.680	143.337	3.093	146.300	142.957	3.093

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.002	S10	1200	Manhole	Adoptable	S6	1200	Manhole	Adoptable
3.000	S11	600	Manhole	Adoptable	S12	600	Manhole	Adoptable
3.001	S12	600	Manhole	Adoptable	S13	1200	Manhole	Adoptable
4.000	S15	600	Manhole	Adoptable	S13	1200	Manhole	Adoptable
3.002	S13	1200	Manhole	Adoptable	S14	1200	Manhole	Adoptable
5.000	S17	600	Manhole	Adoptable	S14	1200	Manhole	Adoptable
6.000	S18	600	Manhole	Adoptable	S19	600	Manhole	Adoptable
6.001	S19	600	Manhole	Adoptable	S20	600	Manhole	Adoptable
6.002	S20	600	Manhole	Adoptable	S14	1200	Manhole	Adoptable
3.003	S14	1200	Manhole	Adoptable	S5	1200	Manhole	Adoptable
1.005	S6	1200	Manhole	Adoptable	S7-FCC	1200	Manhole	Adoptable
1.006	S7-FCC	1200	Manhole	Adoptable	SMH-Ex	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	391297.921	412263.639	146.200	1.425	600				
						0	1.000	144.775	225
S2	391263.995	412271.787	146.300	1.816	600		1	1.000	144.484
						0	1.001	144.484	225
S3	391242.328	412268.968	146.200	1.847	1200		1	1.001	144.353
						0	1.002	144.353	225
S4	391234.847	412277.983	146.200	1.917	1200		1	1.002	144.283
						0	1.003	144.283	225
S5	391241.788	412306.089	146.500	2.532	1200		1	3.003	144.107
						2	1.003	143.993	225
						0	1.004	143.968	250

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S6	391245.089	412319.460	146.500	2.694	1200		1 2 0	2.002 1.004 1.005	144.042 143.806 143.806	225 250 250
S7-FCC	391243.364	412342.843	146.680	3.343	1200		1 0	1.005 1.006	143.337 143.337	250 250
S8	391308.160	412290.104	146.350	1.350	600		 0	 2.000	 145.000	 225
S9	391274.258	412300.239	146.300	1.890	600		1 0	2.000 2.001	144.410 144.410	225 225
S10	391269.303	412312.464	146.400	2.210	1200		1 0	2.001 2.002	144.190 144.190	225 225
S11	391188.176	412279.952	146.850	1.350	600		 0	 3.000	 145.500	 150
S12	391208.257	412274.518	146.850	1.558	600		1 0	3.000 3.001	145.292 145.292	150 150
S13	391218.875	412295.590	146.750	1.938	1200		1 2 0	4.000 3.001 3.002	144.887 144.929 144.812	150 150 225
S14	391226.360	412309.899	146.700	2.275	1200		1 2 3 0	6.002 5.000 3.002 3.003	144.500 144.515 144.489 144.425	150 150 225 225
S15	391183.291	412304.158	146.800	1.350	600		 0	 4.000	 145.450	 150
S17	391194.533	412318.909	146.750	1.500	600		 0	 5.000	 145.250	 150
S18	391193.088	412346.178	146.650	1.350	600		 0	 6.000	 145.300	 150
S19	391228.868	412335.604	146.450	1.647	600		1 0	6.000 6.001	144.803 144.803	150 150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S20	391230.329	412323.835	146.400	1.755	600		1	6.001	144.645	150
							0	6.002	144.645	150
SMH-Ex	391246.881	412355.993	146.300	3.343	1200		1	1.006	142.957	250

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	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 %)
1	0	0	0
30	0	0	0
100	40	0	0

Node S7-FCC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	143.337	Product Number	CTL-SHE-0057-2000-2000-2000
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node S5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	143.968
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	1.600	150.0	0.0	1.601	0.0	0.0

Node S10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	144.190
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	120.0	0.0	1.600	120.0	0.0	1.601	0.0	0.0

Node S14 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	144.425
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

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	175.0	0.0	1.600	175.0	0.0	1.601	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	144.845	0.070	10.3	0.0986	0.0000	OK
15 minute winter	S2	11	144.592	0.108	17.9	0.1031	0.0000	OK
1440 minute winter	S3	1170	144.546	0.193	1.8	0.2956	0.0000	OK
1440 minute winter	S4	1170	144.546	0.263	1.8	0.2974	0.0000	SURCHARGED
1440 minute winter	S5	1170	144.546	0.578	5.7	87.5751	0.0000	SURCHARGED
1440 minute winter	S6	1170	144.546	0.740	2.8	1.1445	0.0000	SURCHARGED
1440 minute winter	S7-FCC	1170	144.546	1.209	1.7	1.5338	0.0000	SURCHARGED
15 minute winter	S8	10	145.051	0.051	7.7	0.0595	0.0000	OK
1440 minute winter	S9	1170	144.546	0.136	1.4	0.1462	0.0000	OK
1440 minute winter	S10	1170	144.546	0.356	2.8	43.1022	0.0000	SURCHARGED
15 minute winter	S11	10	145.545	0.045	3.5	0.0306	0.0000	OK
15 minute winter	S12	11	145.350	0.058	6.9	0.0368	0.0000	OK
15 minute winter	S13	11	144.880	0.068	13.6	0.0774	0.0000	OK
1440 minute winter	S14	1170	144.546	0.121	3.5	21.3921	0.0000	OK
15 minute winter	S15	10	145.508	0.058	7.1	0.0641	0.0000	OK
15 minute winter	S17	10	145.293	0.043	4.7	0.0333	0.0000	OK
15 minute winter	S18	10	145.351	0.051	5.3	0.0457	0.0000	OK
15 minute winter	S19	11	144.872	0.068	8.4	0.0401	0.0000	OK
15 minute winter	S20	11	144.737	0.092	11.3	0.0524	0.0000	OK
15 minute summer	SMH-Ex	1	142.957	0.000	1.3	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	S1	1.000	S2	10.1	0.693	0.213	0.5121	
15 minute winter	S2	1.001	S3	17.6	0.845	0.440	0.4560	
1440 minute winter	S3	1.002	S4	1.8	0.548	0.045	0.4453	
1440 minute winter	S4	1.003	S5	1.8	0.437	0.034	1.1514	
1440 minute winter	S5	1.004	S6	2.2	0.570	0.029	0.6735	
1440 minute winter	S6	1.005	S7-FCC	1.6	0.192	0.016	1.1466	
1440 minute winter	S7-FCC	Hydro-Brake®	SMH-Ex	1.6				132.9
15 minute winter	S8	2.000	S9	7.6	0.691	0.113	0.4063	
1440 minute winter	S9	2.001	S10	1.4	0.664	0.021	0.4275	
1440 minute winter	S10	2.002	S6	-1.4	0.364	-0.036	1.0024	
15 minute winter	S11	3.000	S12	3.4	0.644	0.194	0.1116	
15 minute winter	S12	3.001	S13	6.8	1.087	0.308	0.1474	
15 minute winter	S13	3.002	S14	13.7	1.388	0.186	0.1595	
1440 minute winter	S14	3.003	S5	3.5	0.808	0.047	0.4886	
15 minute winter	S15	4.000	S13	6.8	1.095	0.309	0.2286	
15 minute winter	S17	5.000	S14	4.6	1.121	0.173	0.1356	
15 minute winter	S18	6.000	S19	5.2	0.789	0.252	0.2451	
15 minute winter	S19	6.001	S20	8.2	0.855	0.400	0.1137	
15 minute winter	S20	6.002	S14	11.3	1.035	0.639	0.1587	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S1	1410	145.031	0.256	1.6	0.3605	0.0000	SURCHARGED
1440 minute winter	S2	1410	145.031	0.547	2.8	0.5228	0.0000	SURCHARGED
1440 minute winter	S3	1410	145.031	0.678	3.3	1.0393	0.0000	SURCHARGED
1440 minute winter	S4	1410	145.031	0.748	3.3	0.8464	0.0000	SURCHARGED
1440 minute winter	S5	1410	145.031	1.063	7.6	161.1456	0.0000	SURCHARGED
1440 minute winter	S6	1410	145.031	1.225	3.4	1.8955	0.0000	SURCHARGED
1440 minute winter	S7-FCC	1410	145.031	1.694	2.0	2.1498	0.0000	SURCHARGED
15 minute winter	S8	10	145.080	0.080	18.8	0.0943	0.0000	OK
1440 minute winter	S9	1410	145.031	0.621	2.7	0.6685	0.0000	SURCHARGED
1440 minute winter	S10	1410	145.031	0.841	4.0	101.9067	0.0000	SURCHARGED
15 minute winter	S11	10	145.572	0.072	8.5	0.0495	0.0000	OK
15 minute winter	S12	10	145.394	0.102	16.9	0.0639	0.0000	OK
1440 minute winter	S13	1410	145.031	0.219	2.1	0.2482	0.0000	OK
1440 minute winter	S14	1410	145.031	0.606	6.4	107.2905	0.0000	SURCHARGED
15 minute winter	S15	10	145.552	0.102	17.3	0.1116	0.0000	OK
15 minute winter	S17	10	145.320	0.070	11.6	0.0545	0.0000	OK
15 minute winter	S18	10	145.385	0.085	12.9	0.0759	0.0000	OK
15 minute winter	S19	11	145.145	0.342	20.5	0.2002	0.0000	SURCHARGED
1440 minute winter	S20	1410	145.031	0.386	1.8	0.2195	0.0000	SURCHARGED
15 minute summer	SMH-Ex	1	142.957	0.000	1.5	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)
1440 minute winter	S1	1.000	S2	1.6	0.404	0.034	1.3877	
1440 minute winter	S2	1.001	S3	2.6	0.482	0.065	0.8690	
1440 minute winter	S3	1.002	S4	3.3	0.564	0.081	0.4659	
1440 minute winter	S4	1.003	S5	3.2	0.440	0.062	1.1514	
1440 minute winter	S5	1.004	S6	2.6	0.592	0.034	0.6735	
1440 minute winter	S6	1.005	S7-FCC	1.9	0.166	0.020	1.1466	
1440 minute winter	S7-FCC	Hydro-Brake®	SMH-Ex	1.9				155.7
15 minute winter	S8	2.000	S9	18.6	0.908	0.276	0.7346	
1440 minute winter	S9	2.001	S10	2.6	0.673	0.039	0.5246	
1440 minute winter	S10	2.002	S6	-2.1	0.349	-0.052	1.0024	
15 minute winter	S11	3.000	S12	8.4	0.793	0.473	0.2197	
15 minute winter	S12	3.001	S13	16.5	1.340	0.746	0.2905	
1440 minute winter	S13	3.002	S14	2.1	0.799	0.028	0.6399	
1440 minute winter	S14	3.003	S5	4.6	0.738	0.062	0.6320	
15 minute winter	S15	4.000	S13	16.8	1.357	0.761	0.4546	
15 minute winter	S17	5.000	S14	11.3	1.426	0.427	0.2631	
15 minute winter	S18	6.000	S19	12.7	0.911	0.619	0.5212	
15 minute winter	S19	6.001	S20	18.3	1.039	0.891	0.2088	
1440 minute winter	S20	6.002	S14	1.8	0.608	0.101	0.2551	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	12	146.197	1.422	45.5	1.9999	0.0000	FLOOD RISK
15 minute winter	S2	12	145.994	1.510	70.7	1.4418	0.0000	SURCHARGED
1440 minute winter	S3	1410	145.984	1.631	6.0	2.4987	0.0000	FLOOD RISK
1440 minute winter	S4	1410	145.984	1.701	5.9	1.9238	0.0000	FLOOD RISK
1440 minute winter	S5	1410	145.984	2.016	9.3	243.1836	0.0000	SURCHARGED
1440 minute winter	S6	1410	145.984	2.178	3.6	3.3691	0.0000	SURCHARGED
1440 minute winter	S7-FCC	1410	145.984	2.647	2.7	3.3585	0.0000	SURCHARGED
1440 minute winter	S8	1410	145.984	0.984	2.0	1.1531	0.0000	SURCHARGED
1440 minute winter	S9	1410	145.984	1.574	4.6	1.6935	0.0000	SURCHARGED
1440 minute winter	S10	1410	145.984	1.794	6.3	194.0889	0.0000	SURCHARGED
1440 minute winter	S11	1410	145.984	0.484	0.9	0.3306	0.0000	SURCHARGED
1440 minute winter	S12	1410	145.984	0.692	1.8	0.4353	0.0000	SURCHARGED
1440 minute winter	S13	1410	145.984	1.172	3.7	1.3255	0.0000	SURCHARGED
1440 minute winter	S14	1410	145.984	1.559	11.0	275.8223	0.0000	SURCHARGED
15 minute winter	S15	11	146.088	0.638	31.3	0.7008	0.0000	SURCHARGED
1440 minute winter	S17	1410	145.984	0.734	1.3	0.5696	0.0000	SURCHARGED
15 minute winter	S18	12	146.535	1.235	23.3	1.0988	0.0000	FLOOD RISK
15 minute winter	S19	12	146.055	1.252	31.9	0.7339	0.0000	SURCHARGED
1440 minute winter	S20	1410	145.984	1.339	3.1	0.7606	0.0000	SURCHARGED
15 minute summer	SMH-Ex	1	142.957	0.000	1.6	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	S1	1.000	S2	38.1	0.957	0.803	1.3877	
15 minute winter	S2	1.001	S3	67.3	1.693	1.679	0.8690	
1440 minute winter	S3	1.002	S4	5.9	0.529	0.147	0.4659	
1440 minute winter	S4	1.003	S5	5.8	0.526	0.112	1.1514	
1440 minute winter	S5	1.004	S6	2.8	0.622	0.037	0.6735	
1440 minute winter	S6	1.005	S7-FCC	2.6	0.175	0.026	1.1466	
1440 minute winter	S7-FCC	Hydro-Brake®	SMH-Ex	2.3				181.6
1440 minute winter	S8	2.000	S9	2.0	0.440	0.030	1.4073	
1440 minute winter	S9	2.001	S10	4.4	0.764	0.066	0.5246	
1440 minute winter	S10	2.002	S6	-2.7	0.396	-0.067	1.0024	
1440 minute winter	S11	3.000	S12	0.9	0.443	0.051	0.3662	
1440 minute winter	S12	3.001	S13	1.8	0.750	0.082	0.4154	
1440 minute winter	S13	3.002	S14	3.5	0.801	0.048	0.6422	
1440 minute winter	S14	3.003	S5	4.5	0.807	0.061	0.6320	
15 minute winter	S15	4.000	S13	29.0	1.645	1.312	0.6378	
1440 minute winter	S17	5.000	S14	1.3	0.646	0.049	0.5823	
15 minute winter	S18	6.000	S19	18.8	1.070	0.917	0.6568	
15 minute winter	S19	6.001	S20	30.3	1.720	1.475	0.2088	
1440 minute winter	S20	6.002	S14	3.0	0.640	0.170	0.2551	