



- The drawing to be read in conjunction with all relevant Architects, Engineers and Subcontractors drawings and details.
- All levels relate to levels given on survey drawing.
- Refer to Architects drawings for details of all paving types & patterns, soft landscaping, fences, gates & bollards.
- All works to be carried out in accordance with Sewers for Adoption 7th Edition, BS EN 752 "Drain and sewer systems outside buildings" and the current edition of The Building Regulations "Approved document H".
- New drainage connections are to be made with appropriate lengths of rocker pipes & couplings.
- All manhole chamber covers to be installed parallel to final kerbs, edgings, paving joints or building lines as appropriate.
- This drawing details all below ground drainage up to finished floor level. For details of drainage above finished floor level, refer to Architects drawings.
- All stack connections under buildings to be minimum 100mm diameter solid PVC-U to BS EN 1401-1/BSEN54680 & laid at a minimum gradient of 1 in 60 unless otherwise noted. If the grade is greater than 100mm then the diameter of the connection is to be increased to match it.
- All RWP connections to be minimum 100mm diameter solid PVC-U to BS EN 1401-1/BSEN54680 & laid at a minimum gradient of 1 in 60 unless otherwise noted. If the RWP is greater than 100mm then the diameter of the connection is to be increased to match it.
- All private foul water pipe work up to 450mm in diameter to be PVC-U to BS EN 1401-1/BSEN4660.
- All private surface water pipe work up to 150mm in diameter to be solid PVC-U to BS EN 1401-1/BSEN4660. All private surface water pipe work 225mm and above is to be structured wall plastic flange pipe complying with clause 619.2 of the specification for highway works.
- Plastic channels shall comply with BS EN 1017 and BS 5911-3.
- Acceptable foul water and surface water pipe work up to 225mm in diameter may be installed in certified Ventilated Clay (VC) with flexible spigot and socket joints and shall comply with the requirements of BS EN 295. All acceptable foul water and surface water pipe work 300mm and above must be rigid pipe with flexible spigots and sockets according to BS EN 295 and shall comply with the requirements of BS EN 1916 and BS 5911 Part 1.
- On completion of development all drainage shall be jet cleaned and CCTV surveyed.
- Redundant drains & services marked to be removed are to be dug out with chambers demolished & void filled with Type 1 material to class 803 & 806.
- All existing services shown are based on topographical survey. Location of all services in close proximity to works should be confirmed by means of a competent supervised person. All services to be protected in accordance with HSE document "Avoiding Danger from Underground Services".

CONCRETE

The concrete used shall be as follows:

Concrete characteristic design strength at 28 days;

Blinking Grade C20

Reinforced concrete Grade C32/40

Mass concrete strip footings and pad foundations:

Crushing strength: 25 N/mm²

Minimum Cement Content: 280 kg/m³

Maximum Water Cement ratio: 0.55

Maximum aggregate size: 20mm

Foundations shall be taken to a firm bearing strata to the satisfaction of the Building Inspectors and Engineers.

All excavations are to be lined with blinding concrete or similar approved below specified formation levels or bottomed out in accordance with the specifications.

The integrity of the excavations is to be maintained by the contractor at all times.

All disturbed ground to be reinstated with granular fill in accordance with the specification and to the approval of the engineer.

Soft spots at new foundation levels are to be excavated and back filled with blinding concrete to the approval of the engineer.

The removal of excess water from the site is the responsibility of the contractor. The contractor must satisfy himself with respect to the ground water conditions on site and shall ensure to deal with the likely perched ground water conditions which exist.

Where existing redundant drains occur under new foundations and slabs the are to be grubbed out and back filled with mass concrete.

Reinforcement-grades:
High yield - grade 500 N/mm² (clause e30150) (deformed type 2)
Plain bars - grade 250 N/mm² (clause e30140)
Fabric - grade 500 N/mm² - (clause e30210)

The minimum lap lengths to be as follows:
A393 Mesh – 500mm
Lower bar reinforcement – 50 times the smaller bar diameter
Unless noted otherwise concrete cover to outermost reinforcement to be:
40mm against blinding, 35mm all other faces

LOAD BEARING MASONRY

The following materials here specified are to have a minimum average compressive strength of:

Engineering brickwork.	50N/mm ²
Common brickwork.	20N/mm ²

Mortar shall be as follows 1:3 (cement:sand) below DPC level and 1:1:6 (cement:lime:sand) above DPC level.

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2. ALL SETTING-OUT TO BE CHECKED AGAINST ARCHITECT'S LATEST SETTING OUT DRAWING.

3. NO DIMENSIONS ARE TO BE SCALED FROM THIS DRAWING.

4. NO DEVIATION MAY BE MADE FROM THE DETAILS SHOWN ON THIS DRAWING WITHOUT PRIOR AGREEMENT OF THE ENGINEERS.

5. ANY DISCREPANCY BETWEEN THIS DRAWING AND ANY OTHER DOCUMENT SHOULD BE REFERRED IMMEDIATELY TO THE ENGINEER.

6. ALL WORKSMANSHIP, MATERIALS AND LOADINGS TO BE IN STRICT ACCORDANCE WITH THE LATEST EDITIONS OF:

- EC0 - BASIC STRUCTURAL DESIGN
- EC1 - ACTIONS ON STRUCTURES
- EC2 - DESIGN OF CONCRETE STRUCTURES
- EC3 - DESIGN OF STEEL STRUCTURES
- EC4 - DESIGN OF COMPOSITE STRUCTURES

AND THE BUILDING REGULATIONS, MANUFACTURERS' SPECIFICATIONS AND RECOMMENDATIONS.

CONTRACTOR IS TO ALLOW FOR ALL TEMPORARY WORKS AS NECESSARY TO UNDERTAKE AND MAINTAIN THE STRUCTURAL INTEGRITY OF THE PROPOSED BUILDING AND SURROUNDING STRUCTURES AT ALL TIMES

CONTRACTOR TO PROVIDE FULL DESIGN AND FABRICATION DRAWINGS FOR RETAINING WALLS AND GEOSYNTHETICS CELLBW TIE PROTECT SYSTEM TO BE INSTALLED AS PER MANUFACTURERS RECOMMENDATIONS

NOTE:
Contractor is responsible for liaising between Retaining Wall Designer and Installer and GEOSYNTHETICS Cellbw TIE system and final design aspects for acceptance by Contract Administrator and Clients Design Team

NOTE:
Retaining Wall and GEOSYNTHETICS Cellbw details shown are for indication. All final design and working details are to be designed by Contractors specialist contractor to manufacturer details and provide detailed design and drawings for approval by Clients Design Team

GEOSYNTHETICS details
Jamie Leake tel 01455 241507
jamie.leake@geosyn.co.uk

NOTE:
For all dimensions and setting out refer to architects drawings

NOTE
Refer to M&E specs and drawings for additional excavation locations for incoming and redirected services on site

NOTE:
THE CONTRACTOR IS TO REFER TO ALL RELEVANT INFORMATION PROJECT MANAGERS CONTRACT DOCUMENTATION, ARCHITECTS SPEC AND DRAWING M&E SPEC AND DRAWINGS QUARTET DESIGN AGRICULTURAL CONSULTANTS SPEC AND DRAWINGS SOIL INVESTIGATION REPORT, TOPO SURVEY, SUBSANC SURVEY, UTILITIES REPORT.

NOTE:
THE CONTRACTOR IS TO REFER TO STARBUCKS DEVELOPER DRAFT THOUGH SPECIFICATION AND ALL DRAWINGS

CONTRACTOR IS TO CHECK WITH DESIGN TEAM FOR THE LATEST REVISION SPECIFICATION AND ALL DRAWINGS

Contractors Design & Tender Requirements

The contractor's is to ensure full compliance with the Project Managers, Architects, M&E, Environmental, Engineers and Tenants specifications / requirements.

Contractor is to allow for detailed design of all retaining walls, geosynthetics Cellbw and detailed fabrication drawings including full dimensioned drawings for approval by Design Team

Contractor is to Allow for liaising with Thames Water and making applications for off site connections to existing public sewerage system for separate surface water and foul water connections and for all application fees

ISSUED FOR PLANNING CONDITION 6	GB	11.06.26
DRAWING TITLE CORRECTED	GB	28.05.26
MH_SW19 NOTE FOR DOWNSTREAM DEFENDER VORTEX SEPARATOR ADDED		
ISSUED FOR TENDER	GB	26.05.26
REVISION	BY	DATE

DRAWING STATUS

ISSUE

DRAWING TITLE

PROPOSED SURFACE
WATER AND FOUL WATER
DRAINAGE LAYOUT

PROJECT

STARBUCKS POD,
SCOURS LANE,
TILEHURST,
READING, RG30 6AX

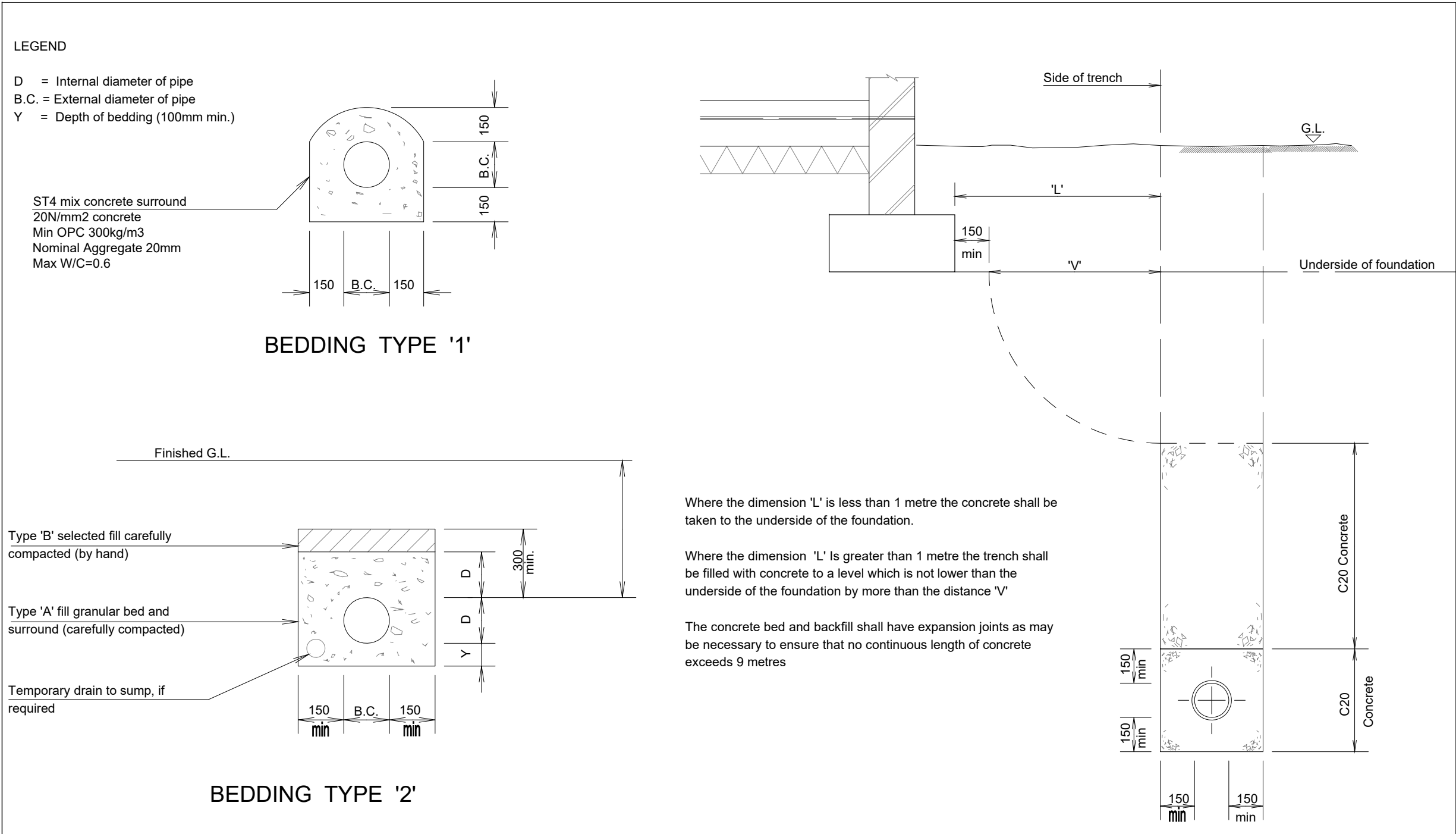


Devonshire House
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60 Goswell Road
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www.simpsoneng.com

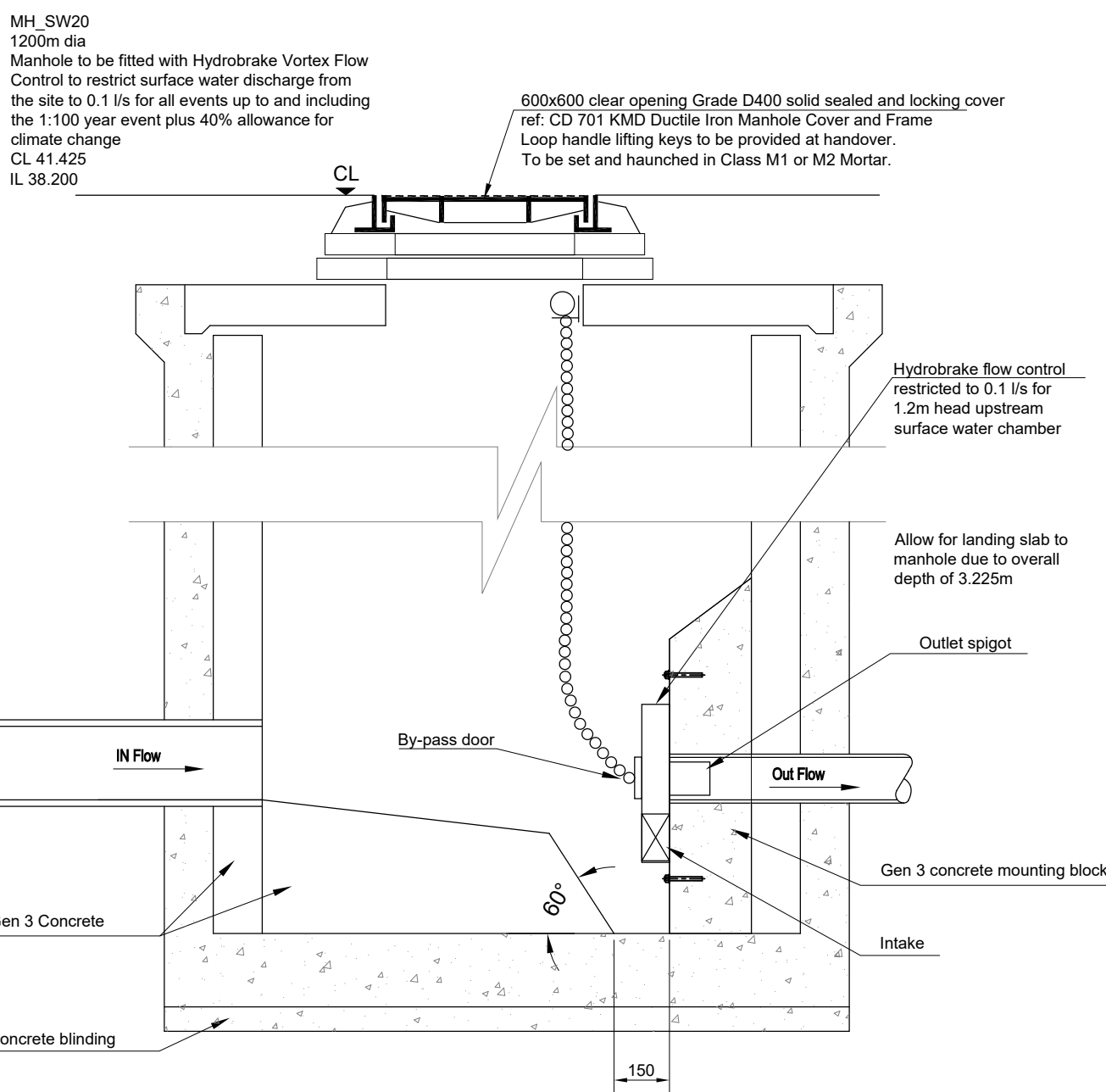
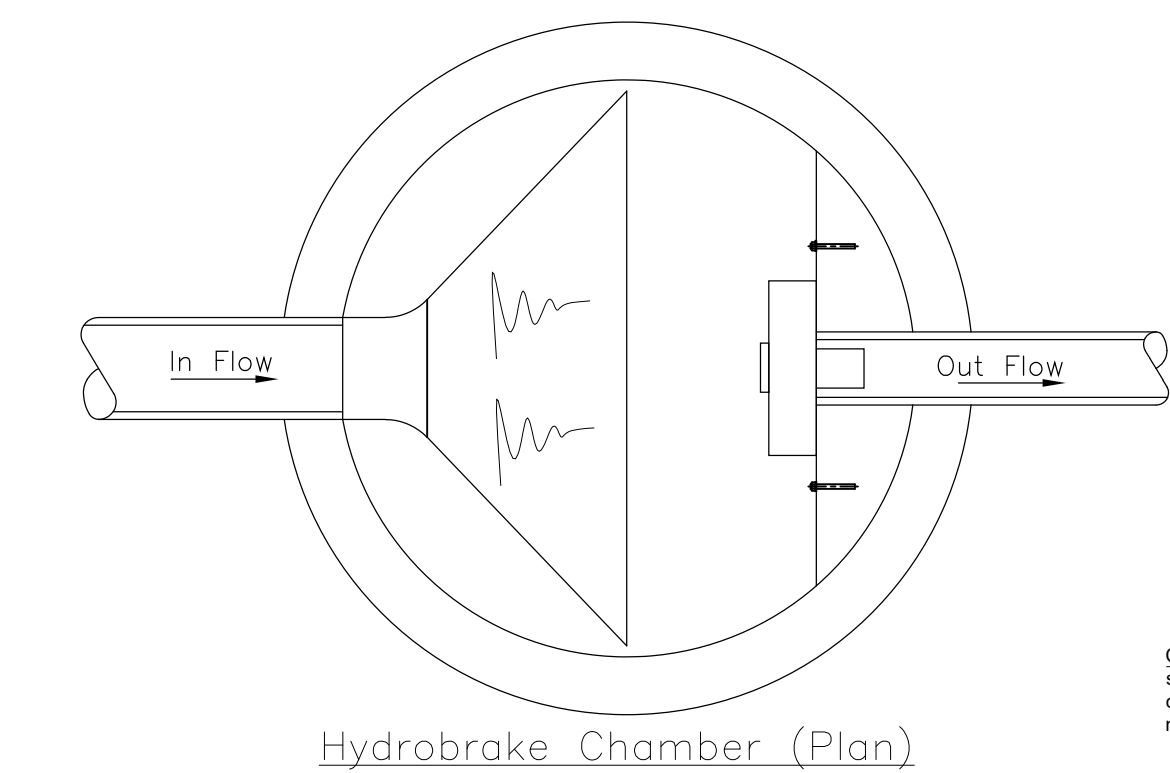


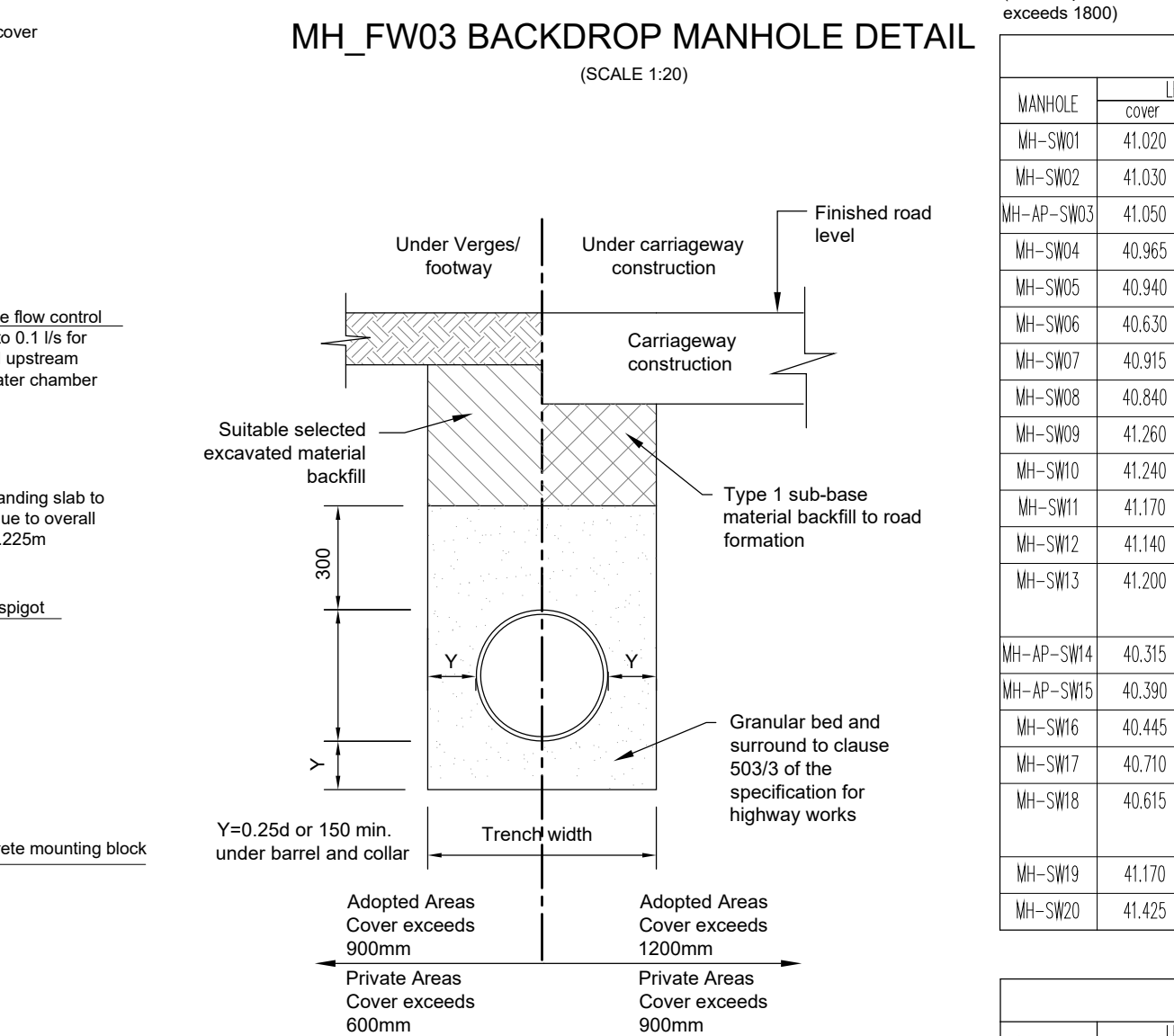
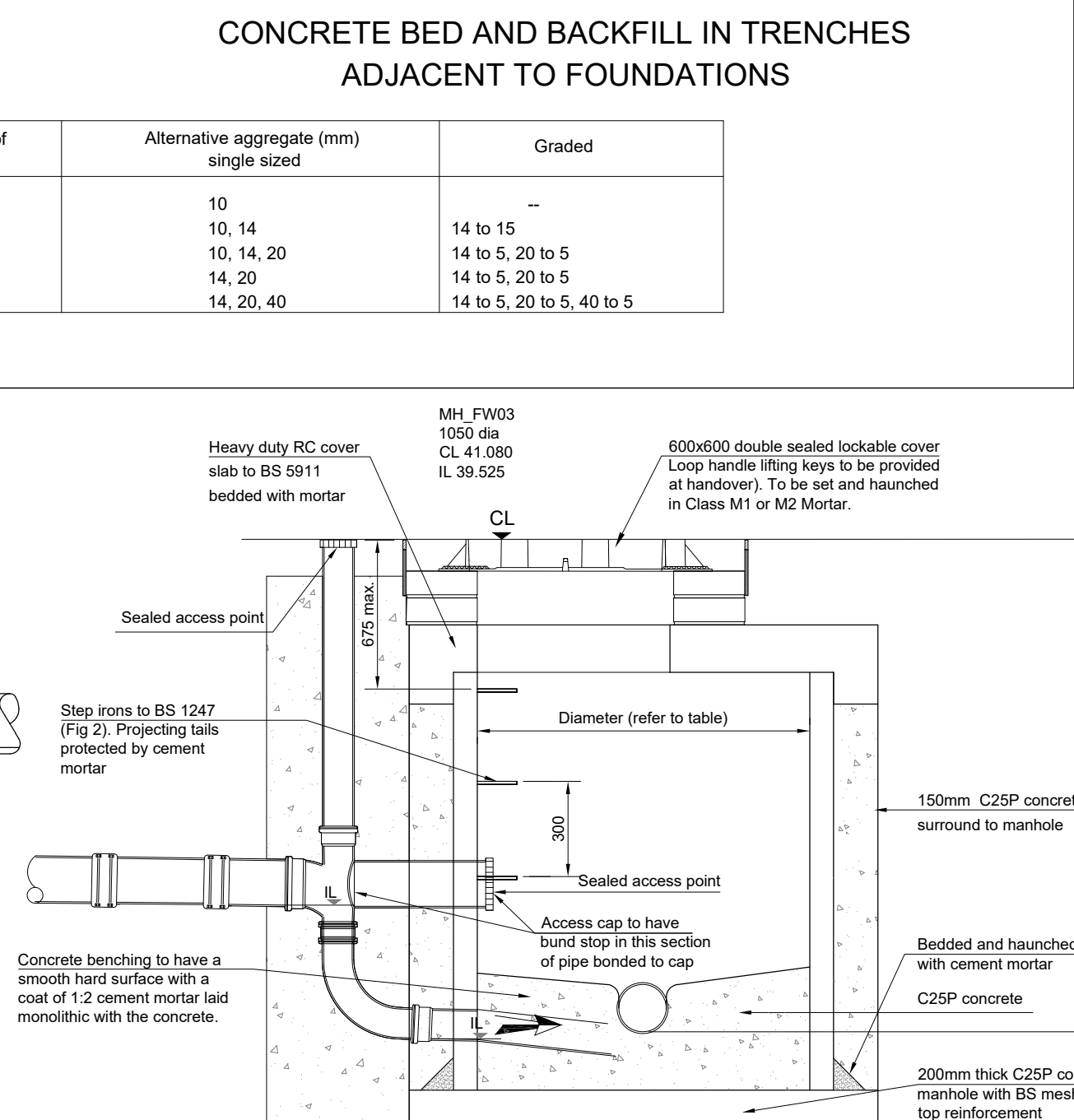
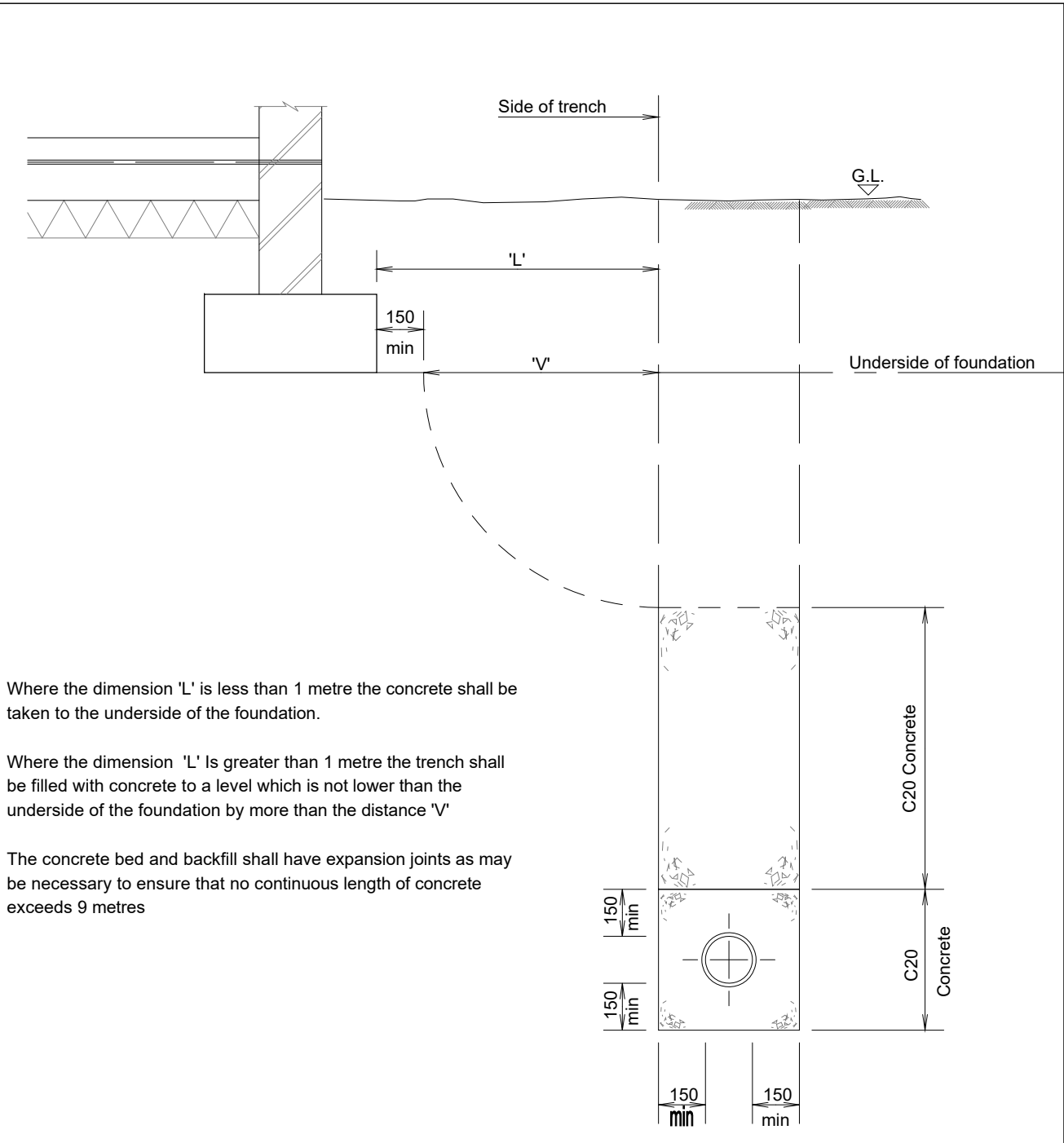
London, Henley-on Thames and Gloucester

Drawn GB	Ch'kd -	Scales 1:150	Date 08/04/26
Purpose of Issue ISSUE			
Project Number P24-0805		Drawing Number PH01	Revision P1

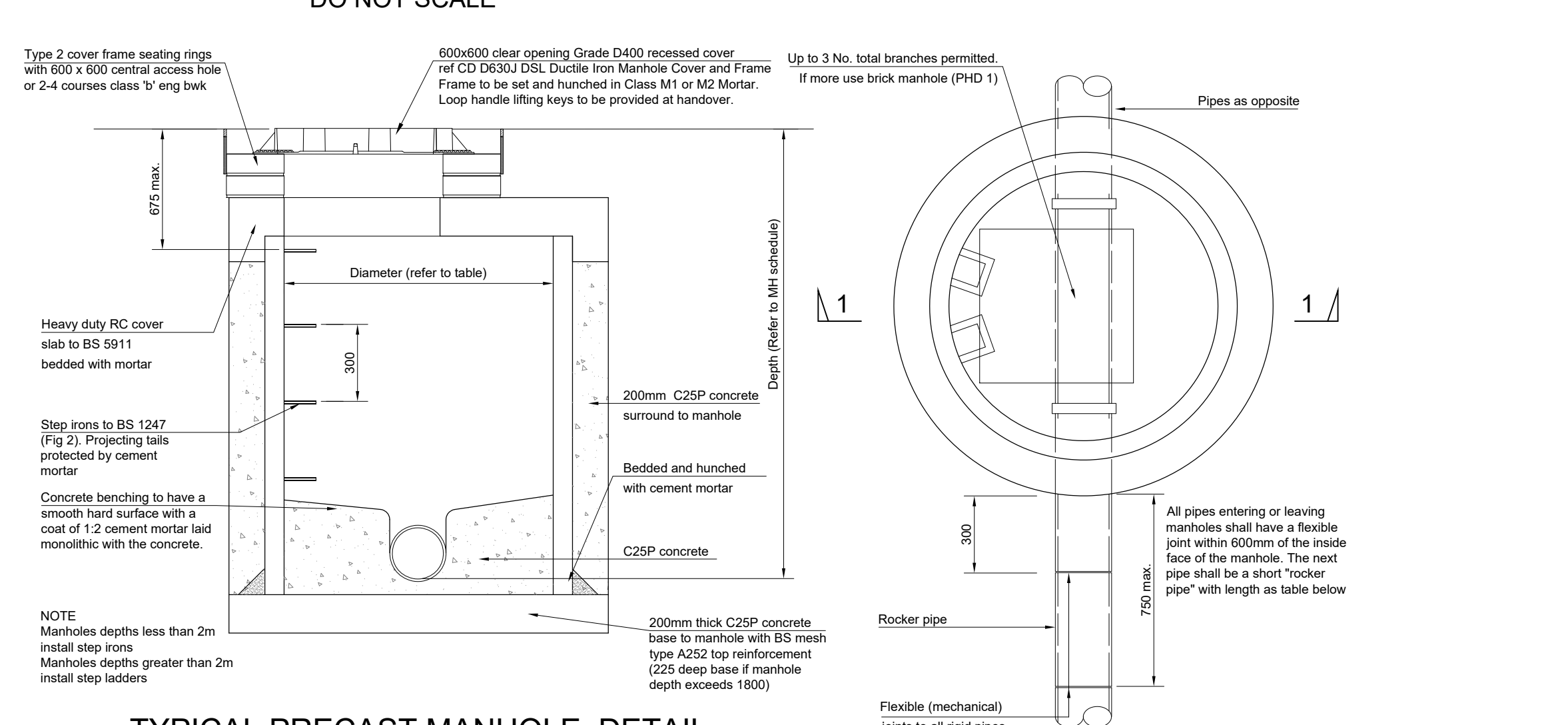


- Type 'A' fill - granular material for beds and surrounds, the material shall be coarse aggregate to B.S. 882 Table 1, 10mm nominal size.
- Type 'B' fill - shall be uniform, readily compactable material free from tree roots, vegetable matter, building rubbish and frozen soil and excluding clay lumps retained on a 75mm sieve and stones on a 28mm sieve.
- For flexible pipe joints use 12mm flexible baffle between each section of concrete surround.
- Type '1' to be flexibly jointed as per specification.
- Bedding type '1' to be used -
 - Where pipe is adjacent to underside of foundations
 - Where crown of pipe is less than 600mm below finished ground level.
 - Where crown of pipe is less than 900mm below a road





Class S Granular Surround



TYPICAL PRECAST MANHOLE DETAIL

MIN. MANHOLE SIZES	
DEPTH	DIAM.
900-1350	900
1351-1500	1050
1501-2500	1200

MH Dia also subject to pipe diameter refer to MH schedule

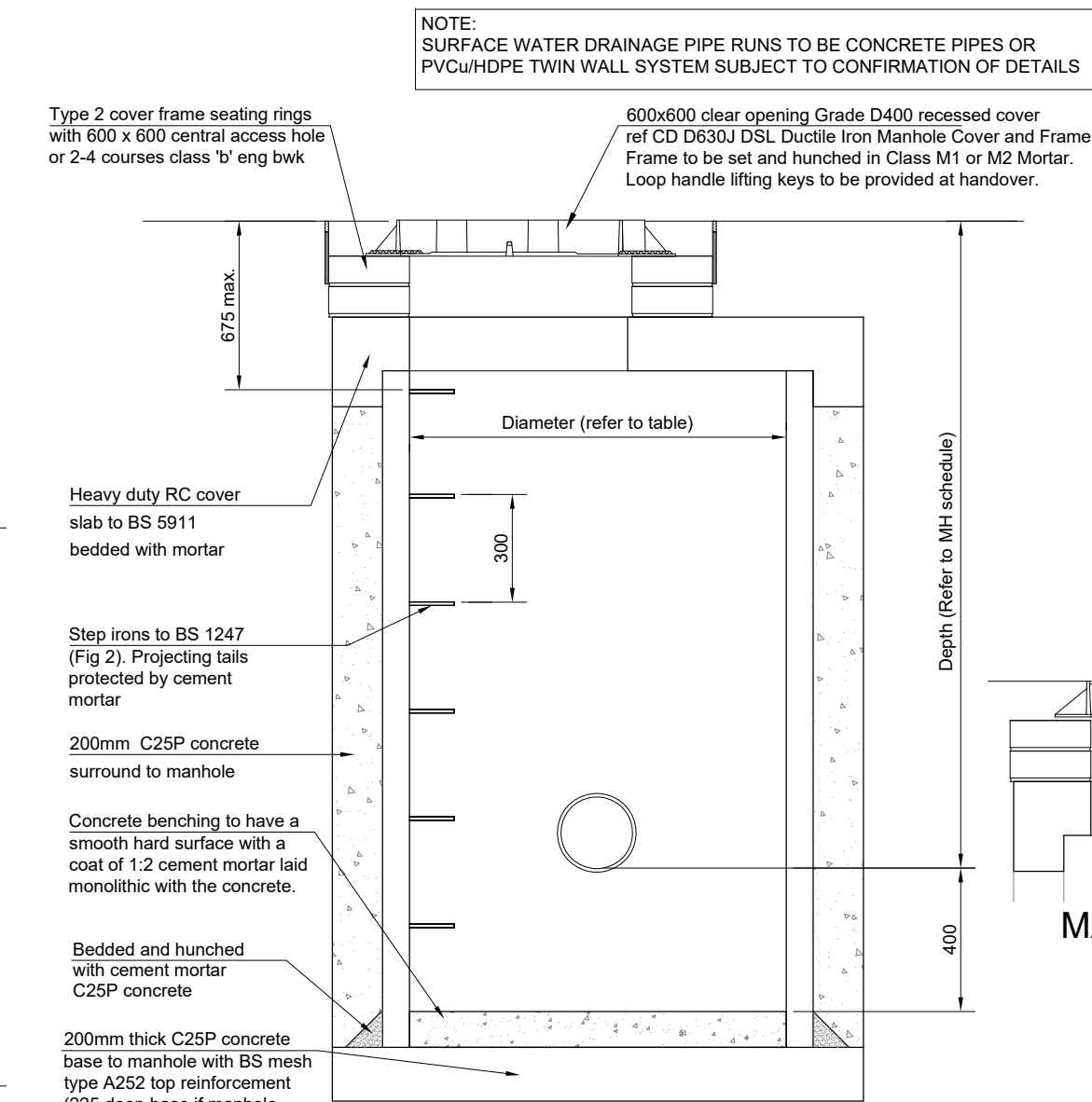
All precast concrete components to be in accordance with BS 5911 part 2 and to have tongue & groove / ogee joints.

Joints to liberally coated with approved bituminous jointing material of trowelling grade before being fixed in position

Joints to be neatly struck off on internal surface.

Lifting holes in P.C. units to be cleaned and filled with cement mortar.

All concrete in contact with the ground to be S.R.P.C.



TYPICAL PRECAST SILT TRAP MANHOLE DETAIL

LEVELS		INTERNAL		CONITION	grade	opening	COVER		reference	NOTES
cover	invert	MANHOLE	INLET				type	size		
MH-SW01	41.020	40.230	790	475 dia	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-SW02	41.030	39.450	1580	1050 dia	Silt Trap	D400	600x600	CD 701 KMD Ductile Iron Solid Cover and Frame	400mm deep silt trap	-
MH-AP-SW03	41.050	40.100	950	100 dia	-	D400	600x600	-	Rodding Access Point	-
MH-SW04	40.965	40.025	940	600 dia	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-SW05	40.940	39.450	1490	1050 dia	Silt Trap	D400	600x600	CD 701 KMD Ductile Iron Solid Cover and Frame	400mm deep silt trap	-
MH-SW06	40.630	39.270	1360	900 dia	Silt Trap	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	400mm deep silt trap	-
MH-SW07	40.915	39.160	1755	1200 dia	Silt Trap	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	400mm deep silt trap	-
MH-SW08	40.840	38.925	1915	1200 dia	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-SW09	41.260	40.040	1220	900 dia	-	D400	600x600	CD 701 KMD Ductile Iron Solid Cover and Frame	-	-
MH-SW10	41.240	39.800	1440	1050 dia	-	D400	600x600	CD 701 KMD Ductile Iron Solid Cover and Frame	-	-
MH-SW11	41.170	38.400	2770	1200 dia	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-SW12	41.140	38.800	2340	1200 dia	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-SW13	41.200	38.900	800	See Note	SW Tank	-	-	Surface Water Storage Tank Polystyrene Modular Units 9m x 5.5m x 0.8m dp (39.6m ³ of Surface Water Storage - Polystyrene Units 0.5m x 1m x 0.4m dp) @ 40.820 to 41.200 - TOT 39.700 - BOT 38.900	-	-
MH-AP-SW14	40.315	39.510	805	475 dia	-	D400	600x600	-	Rodding Access Point	-
MH-AP-SW15	40.390	39.400	990	475 dia	-	D400	600x600	-	Rodding Access Point	-
MH-SW16	40.445	39.240	1205	900 dia	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-SW17	40.710	38.500	2210	1200 dia	Silt Trap	D400	600x600	CD 701 KMD Ductile Iron Solid Cover and Frame	400mm deep silt trap	-
MH-SW18	40.615	38.900	800	See Note	SW Tank	-	-	Surface Water Storage Tank Polystyrene Modular Units 16.5m x 5.5m x 0.8m dp (72.6m ³ of Surface Water Storage - Polystyrene Units 0.5m x 1m x 0.4m dp) @ 40.815 to 41.150 - TOT 39.700 - BOT 38.900	-	-
MH-SW19	41.170	38.675	2495	1200 dia	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-SW20	41.425	38.200	3225	1200 dia	-	D400	600x600	CD 701 KMD Ductile Iron Solid Cover and Frame	-	-

NOTE:- Manhole covers by www.dark-drain.com (tel 01733 765317)

LEVELS		INTERNAL		CONITION	grade	opening	COVER		reference	NOTES
cover	invert	MANHOLE	INLET				type	size		
MH-FW01	41.070	40.445	625	475	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-FW02	41.080	40.100	980	900	-	D400	600x600	CD D630J DSL Ductile Iron Recessed Cover and Frame	-	-
MH-FW03a	41.080	39.525	1555	1050	-	D400	600x600	CD 701 KMD Ductile Iron Solid Cover and Frame	-	-

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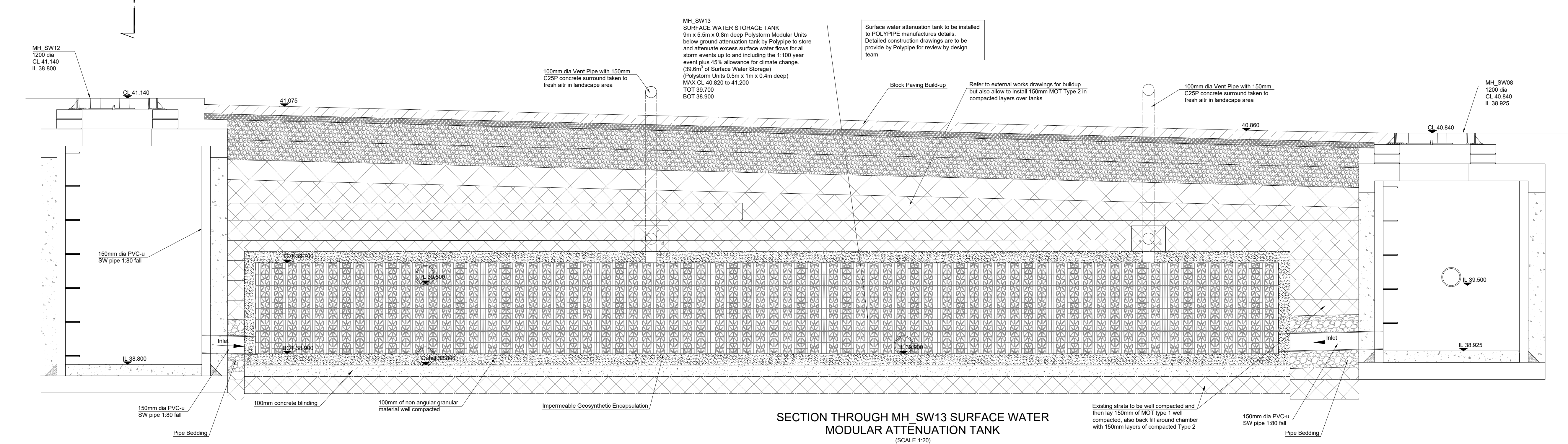
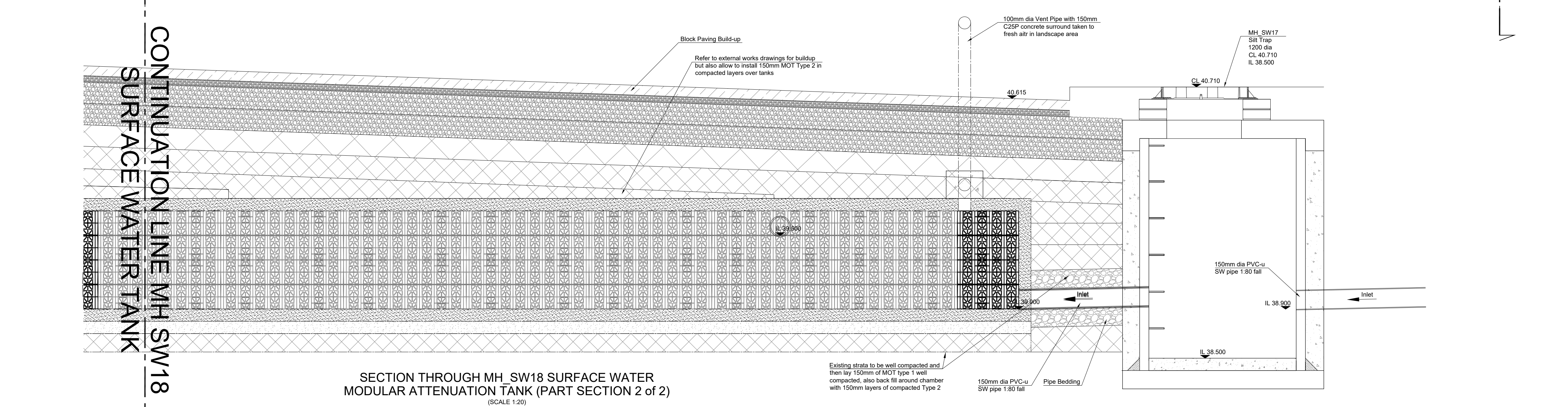
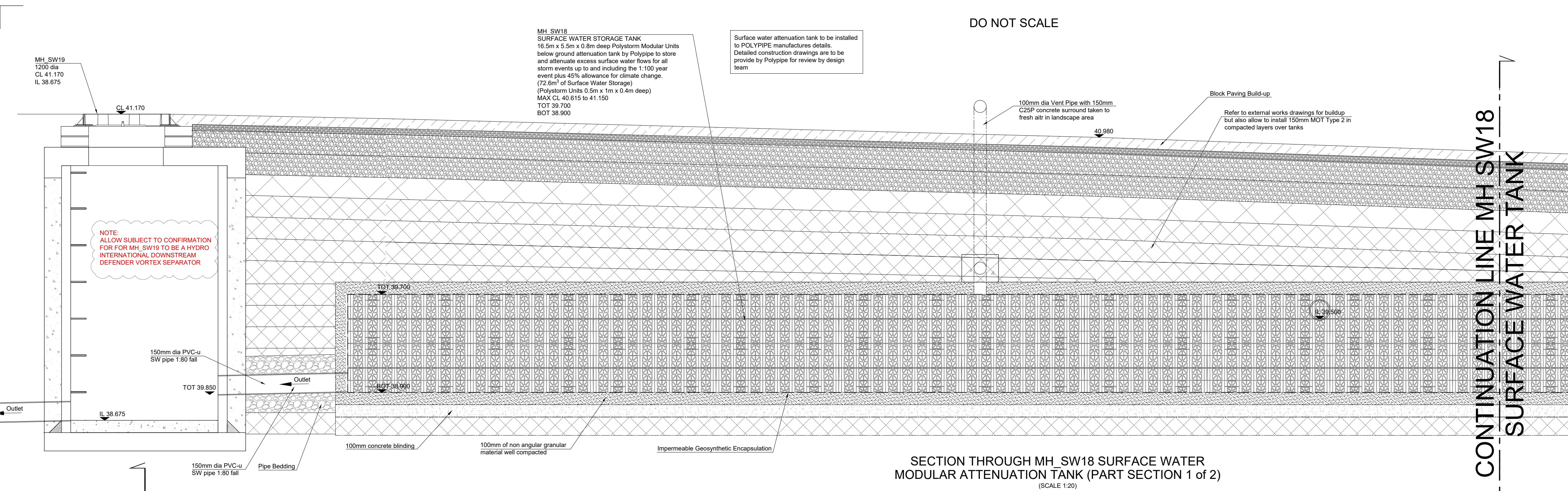
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ENGINEERING NOTES

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- All RWP connections to be minimum 100mm diameter solid PVC-U to BS EN 1401-1BS4660 & laid at a minimum gradient of 1 in 80 unless otherwise noted. If the RWP is greater than 100mm then the diameter of the connection is to be increased to match it.
- All private foul water pipework up to 150mm in diameter to be PVC-U to BS EN 1401-1BS4660.
- All private surface water pipework up to 150mm in diameter to be solid PVC-U to BS EN 1401-1BS4660. All private surface water pipework 225mm and above to be structured wall plastic sewer pipe complying with clause 518 of the specification for highway works.
- Plastic chambers shall comply with BS EN 1917 and BS 5911-3.
- All adoptable foul water and surface water pipework up to 225mm in diameter to be Kitemark certified Vitrified Clay (VC) with flexible spigot and socket joints and shall comply with the requirements of BS EN 295. All adoptable foul water and surface water pipework 300mm and above to be concrete sewer pipe with flexible spigot and socket joints and shall comply with the requirements of BS EN 1916 and BS 5911, Part 1.
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- All existing services shown are based on topographical survey. Location of all services in close proximity to works should be confirmed by means of trial pits under supervision of statutory undertaker & in accordance with HSE document 'Avoiding Danger from Underground Services'.

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- NO DIMENSIONS ARE TO BE SCALED FROM THIS DRAWING.
- NO DEVIATION MAY BE MADE FROM THE DETAILS SHOWN ON THIS DRAWING WITHOUT PRIOR AGREEMENT OF THE ENGINEERS.
- ANY DISCREPANCY BETWEEN THIS DRAWING AND ANY OTHER DOCUMENT SHOULD BE REFERRED IMMEDIATELY TO THE ENGINEER.
- ALL WORKMANSHIP, MATERIALS AND LOADINGS TO BE IN STRICT ACCORDANCE WITH THE LATEST EDITIONS OF:
 - ECO - BASIC STRUCTURAL DESIGN
 - EC1 - ACTIONS ON STRUCTURES
 - EC2 - DESIGN OF CONCRETE STRUCTURES
 - EC3 - DESIGN OF STEEL STRUCTURES
 - EC7 - GEOTECHNICAL DESIGN
 - THE BUILDING REGULATIONS, MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.

CONTRACTOR IS TO ALLOW FOR ALL TEMPORARY WORKS AS NECESSARY TO UNDERTAKE AND MAINTAIN THE STRUCTURAL INTEGRITY OF THE PROPOSED BUILDING AND SURROUNDING STRUCTURES AT ALL TIMES.

CONTRACTOR TO PROVIDE FULL DESIGN AND FABRICATION DRAWINGS FOR RETAINING WALLS AND GEOSYNTHETICS CELLWEB TREE PROTECTION SYSTEM TO BE INSTALLED AS PER MANUFACTURERS RECOMMENDATIONS.

NOTE:
Contractor is responsible for liaising between Retaining Wall Designer and Installer and GEOSYNTHETICS Cell web system and final design aspects for acceptance by Contract Administrator and Clients Design Team

NOTE:
Retaining Wall and GEOSYNTHETICS Cellweb details shown are for indication. All final design and working details are to be designed by Contractors specialist contractor to manufacturer details and provide detailed design and drawings for approval by Clients Design Team
GEOSYNTHETICS details:
Jamie Leake tel 01455 241507
jamie.leake@geosyn.co.uk

NOTE:
For all dimensions and setting out refer to architects drawings

NOTE:
Refer to M&E spec and drawings for additional excavation locations for incoming and redirected services on site

NOTE:
THE CONTRACTOR IS TO REFER TO ALL RELEVANT INFORMATION
PROJECT MANAGERS CONTRACT DOCUMENTATION, ARCHITECTS SPEC AND DRAWING
M&E SPEC AND DRAWINGS
QUARTET DESIGN ARBORICULTURAL CONSULTANTS SPEC AND DRAWINGS
SOIL INVESTIGATION REPORT, TOPO SURVEY, SUBSCAN SURVEY, UTILITIES REPORT.

NOTE:
THE CONTRACTOR IS TO REFER TO STARBUCKS DEVELOPER DRIVE THROUGH SPECIFICATION AND ALL DRAWINGS

CONTRACTOR IS TO CHECK WITH DESIGN TEAM FOR THE LATEST REVISION SPECIFICATION AND ALL DRAWINGS

Contractors Design & Tender Requirements

The contractor's is to ensure full compliance with the Project Managers, Architects, M&E, Arboriculturist, Engineers and Tenants specifications / requirements.

Contractor is to allow for detailed design of all retaining walls, Geosynthetics Cellweb and detailed fabrication drawings including full dimensioned drawings for approval by Design Team

Contractor is to Allow for liaising with Thames Water and making applications for off site connections to existing public sewer system for separate surface water and foul water connections and for all application fees

P1	ISSUED FOR PLANNING CONDITION 6	GB	11.06.26
T2	DRAWING TITLE CORRECTED	GB	28.05.26
	MH_SW19 NOTE FOR DOWNSTREAM DEFENDER VORTEX SEPARATOR ADDED		
TT	ISSUED FOR TENDER	GB	26.05.26
MR	REVISION	BY	DATE

DRAWING STATUS

ISSUE

DRAWING TITLE

PROPOSED SURFACE WATER AND FOUL WATER DRAINAGE DETAILS (SHEET 2 OF 2)

PROJECT

STARBUCKS POD,
SCOURS LANE,
TILEHURST,
READING, RG30 6AX

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Devonshire House
Fourth Floor
60 Goswell Road
London, EC1M 7AD
Tel: 020 7253 2626
E: mail@simpsoneng.com
W: www.simpsoneng.com



London, Henley-on Thames and Gloucester

Drawn GB	Chkd -	Scales 1:20	Date 08/04/26
Purpose of Issue ISSUE			
Project Number P24-0805	Drawing Number PH03	Revision P1	

APPENDIX B - SIMPSONTWS EXTERNAL WORKS DRAWINGS

- P24-0805_EW01 - PROPOSED EXTERNAL WORKS LAYOUT AND PROPOSED LEVELS
- P24-0805_EW02 - PROPOSED EXTERNAL WORKS DETAILS

DO NOT SCALE

GENERAL N

STEELWORK

All steelwork to be designed in accordance with BS EN 1993-1-1, 2005 unless stated otherwise, all steel shall be to BS EN 10025.

All structural steelwork is to be grade S355 except where noted otherwise

All steelwork is to be shot blasted to Sa 2.5 or equivalent to remove all loose rust and mill scale and primed with Epoxy Zinc Phosphate primer to DFT 100 microns.

Delivery to site, in accordance with BS 5453, 1977 Code of Practice for Protected Coating of Iron and Steel Structures against Corrosion.

Following installation the steelworks shall be cleaned and prepared and any damage caused to the protective coating during construction shall be spot primed prior to final decoration.

Any connection shall be made using a minimum of 4M16 bolts or as specified on the drawings and details.

All bolts shall be grade 8.8.

All welds shall be 8mm fillet, except where specified otherwise.

All welds are to be full profile and continuous. All end plates/capping plates to be F.S.B.W. to RHS/CHS with plate edges prepared.

All end plates/capping plates to be profiled to shape of section.

All end plates to be a laminar-free material.

For factored design loads refer to calculations and all connection shall be designed for the loads noted in SIMPSON WTS Calculation package.

At beam to column connections, the centre line of the column shall coincide with the centre line of the beam unless noted otherwise.

Steelwork built into masonry walls or in contact with masonry shall be painted with 3 coats of RWR or similar approved bituminous paint.

All steelwork below ground to be embedded in minimum 75mm structural gr concrete wrapped in D49 mesh.

FIRE PROTECTION

All structural steelwork requires a minimum protection period to be confirmed by Others

CONCRETE

The concrete used shall be as follows:

Concrete characteristic design strength at 28 days	
Blinking	Grade C20
Reinforced concrete	Grade C32/40

Mass concrete strip footings and pad foundations:

Crushing strength: 25 N/mm²

Minimum Cement Content: 280 kg/m³

Maximum Water Cement ratio: 0.55

Maximum aggregate size: 20mm

Foundations shall be taken to a firm bearing strata to the satisfaction of the Building Inspectors and Engineers.

All excavations are to be lined with blending concrete or similar approved below specified formation levels or bottomed out in accordance with the specifications.

The integrity of the excavations is to be maintained by the contractor at all times.

All disturbed ground to be reinstated with granular fill in accordance with the specification and to the approval of the engineer.

Soft spots at new foundation levels are to be excavated and back filled with blending concrete to the approval of the engineer.

The removal of excess water from the site is the responsibility of the contractor. The contractor is to take responsibility himself with respect to the ground water conditions on site & take measures to deal with the likely perched ground water conditions which exist.

Where existing redundant drains occur under new foundations and slabs they are to be grubbed out and back filled with mass concrete.

Reinforcement-grades;
High yield - grade 500 N/mm² (clause e30/150) (deformed type 2)
Plain bars - grade 250 N/mm² (clause e30/140).
Fabric - grade 500 N/mm² - (clause e30/210).

The minimum lap lengths to be as follows

A393 MESH – 500mm
Loose bar reinforcement – 50 times the smaller bar diameter
Unless noted otherwise concrete cover to outermost reinforcement to be
40mm against blinding, 35mm all other faces

LOAD BEARING MASONRY

The following materials where specified are to have a minimum average compressive strength of:-

Engineering brickwork.	50N/mm ²
Common brickwork.	20.5N/mm ²

Mortars shall be as follows 1:3 (cement: sand) below DPC level and 1:1: (cement: lime: sand) above DPC level.

NOTE

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEER'S & SUB-CONTRACTOR'S DRAWINGS AND DETAILS AND THE PROJECT SPECIFICATION. WHERE ANY DISCREPANCY MAY EXIST BETWEEN THESE NOTES THE SPECIFICATION, THE SPECIFICATION SHALL PREVAIL.
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GEOSYNTHETICS details
Jamie Leake tel 01455 241507
jamie.leake@geosyn.co.uk

NOTE:
For all dimensions and setting out refer to architects drawings

NOTE
Refer to M&E spec and drawings for additional excavation locations for incoming and redirected services on site

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QUARTET DESIGN ARBORICULTURAL CONSULTANTS
SPEC AND DRAWINGS
SOIL INVESTIGATION REPORT,
TOPO SURVEY,
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UTILITIES REPORT,

NOTE:
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STARBUCKS DEVELOPER DRIVE THOUGH
SPECIFICATION AND ALL DRAWINGS

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P1	ISSUED FOR PLANNING CONDITION 6	GB	11.06.
T2	SW & FW MANHOLE POSITIONS ADDED	GB	26.05.
T1	ISSUED FOR TENDER	GB	13.05.
MK	REVISION	RY	DAT

DRAWING STATUS

ISSUE

DRAWING TITLE

PROPOSED EXTERNAL WORKS LAYOUT AND PROPOSED LEVELS

PROJECT

STARBUCKS POD,
SCOURS LANE,
TILEHURST,
READING, RG30 6AX



Devonshire House
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www.simpsoneng.com

International Association of Agricultural Librarians and Documentalists (IAALD)	International Association of Agricultural Librarians and Documentalists (IAALD)

London, Henley-on Thames and Gloucester

Drawn GB	Ch'kd -	Scales 1:150	Date 08/04/26
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Purpose of Issue	1. To provide a forum for the exchange of ideas and information among researchers and practitioners in the field of health communication. 2. To disseminate research findings and best practices in health communication. 3. To provide a platform for critical review and discussion of health communication research and practice. 4. To promote collaboration and partnership between researchers and practitioners. 5. To advance the field of health communication through the publication of high-quality research and practice articles.
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ISSUE

Project Number

Drawing Number	
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Revision

SIGNAGE FOUNDATION SIZES
TYPE 1: 6m TOTEM POLE SIGN
 2.5m x 2.5m x 1.5m deep MC Foundation
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

TYPE 2: 12m TOTEM POLE SIGN
 2.5m x 2.5m x 1.5m deep MC Foundation
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

TYPE 3: 12m 3 PLAYS TOP, MIDDLE AND BOTTOM
 75mm cover C30/37 Concrete
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

TYPE 4: 2m RESTRICTED HEIGHT CLEARANCE
 1.5m x 1.5m x 1.5m deep MC Foundation
 1125mm @ 100mm crs in both directions top and bottom 50mm cover
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

TYPE 5: 3m DT MENU BOARD
 1.5m x 1.5m x 1.2m deep MC Foundation
 C30/37 Concrete
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

TYPE 6: 4m DT ORDER CANOPY
 1.5m x 1.5m x 1.2m deep MC Foundation
 C30/37 Concrete
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

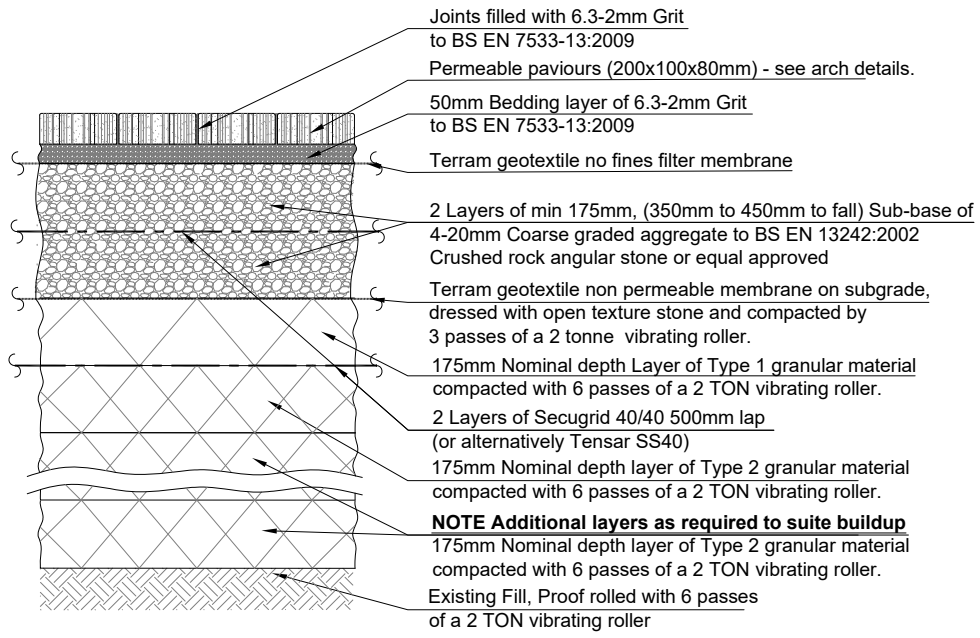
TYPE 7: 2m WAYFINDER GRAPHIC ORDER POINT
 1.5m x 1.5m x 1.2m deep MC Foundation
 C30/37 Concrete
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

TYPE 8: DT DIRECTION SIGN
 0.9m x 1.0m x 0.9m deep MC Foundation
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

TYPE 9: 1m DT RECESSED LANE STOP MARKING
 1.0m x 1.0m x 0.9m deep MC Foundation
 Top of foundation set 100mm below paving level
 (refer to Starbucks drawing for installation fixings and details)

CONTRACTOR TO ALLOW FOR ALL OTHER SIGNAGE FOUNDATIONS AND STARBUCKS EXTERNAL AREA
ANNUITY

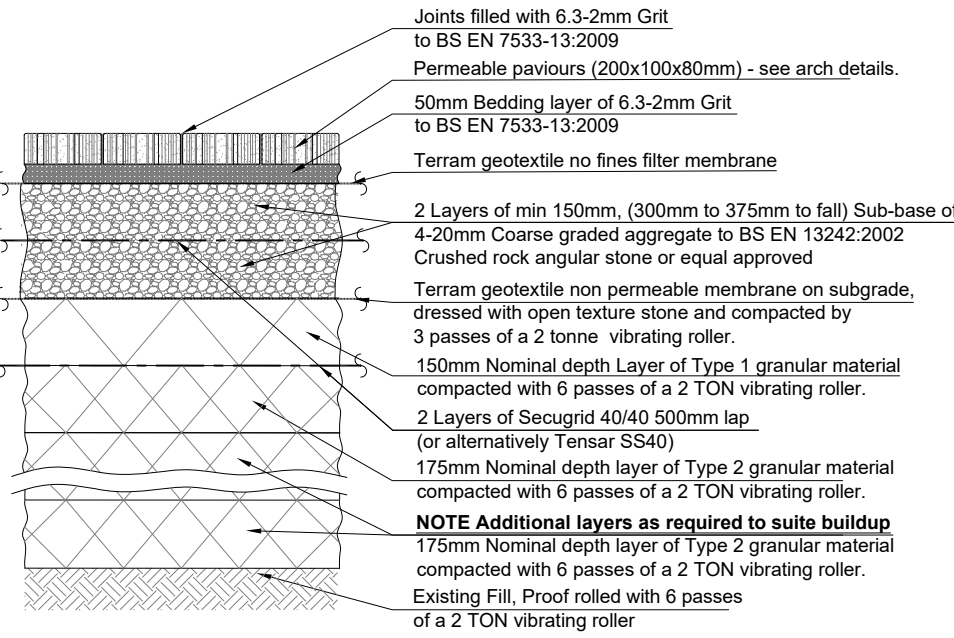
DO NOT SCALE



SPECIFICATION - A

TYPICAL BUILDUP DETAIL OF PERMEABLE ACCESS ROAD, DRIVE THROUGH AND LOADING BAY AREA

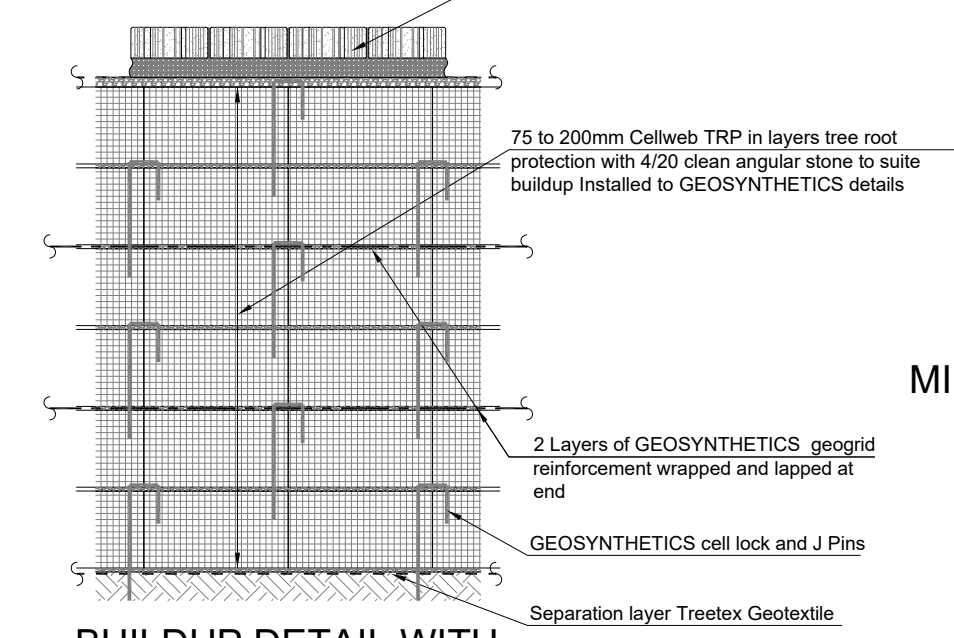
(Scale 1:20)



SPECIFICATION - B

TYPICAL BUILDUP DETAIL OF PERMEABLE CAR PARKING BAY AREA

(Scale 1:20)



BUILDUP DETAIL WITH FULL DEPTH CELLWEB AREA

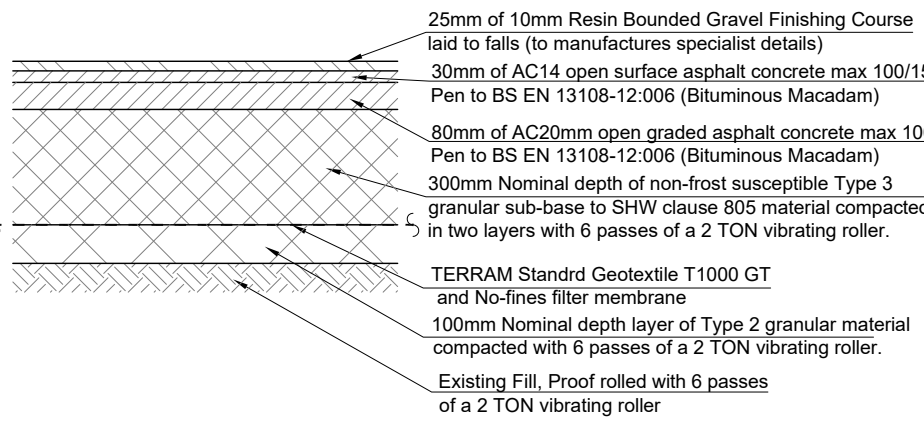
BUILDUP DETAIL WITH MINIMAL DEPTH CELLWEB AREA

NOTE
Geosynthetic Cell Web details / buildup shown are taken from initial review with Geosynthetics and are subject to full detailed design from Geosynthetics as part of contractor design element

SPECIFICATION - C

TYPICAL BUILDUP DETAIL FOR SPECIFICATION A and B AREAS WITH REQUIRED OPTION FOR FULL DEPTH CELLWEB AREA AND MINIMAL DEPTH CELLWEB AREA

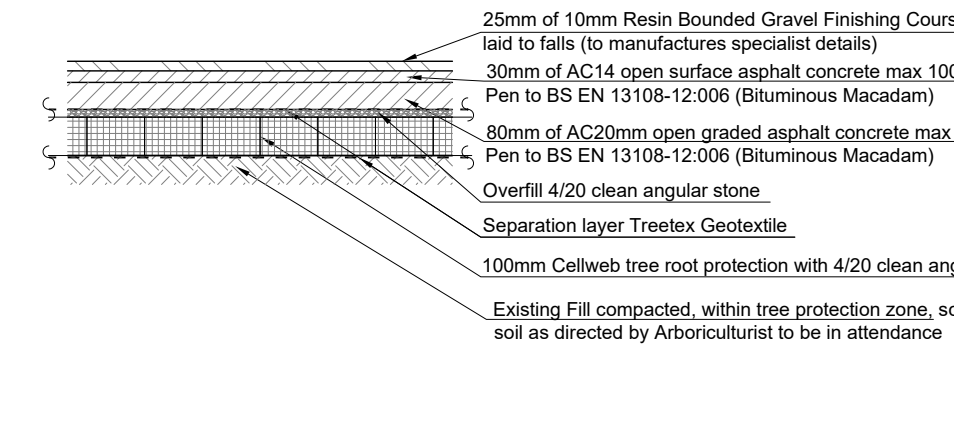
(Scale 1:20)



SPECIFICATION - D

RESIN BOUNDED PEDESTRIAN FOOTPATH LINK AREA BUILDUP

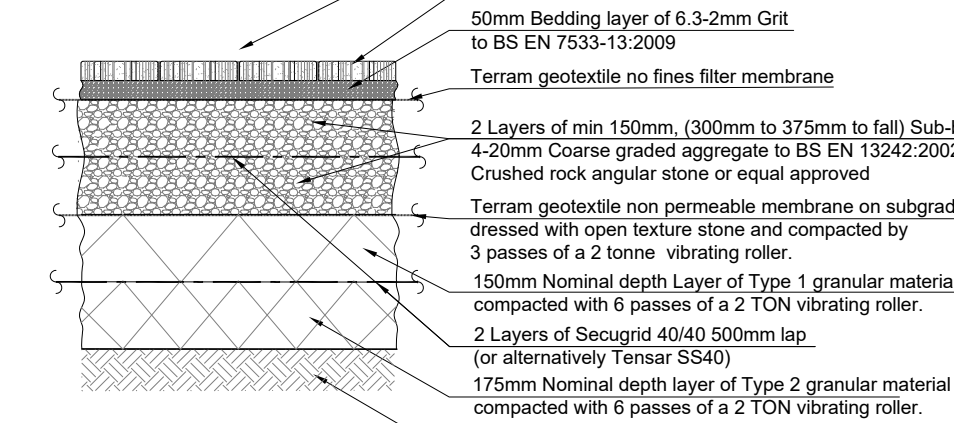
(Scale 1:20)



SPECIFICATION - E

RESIN BOUNDED PEDESTRIAN FOOTPATH LINK AREA WITH CELLWEB BUILDUP

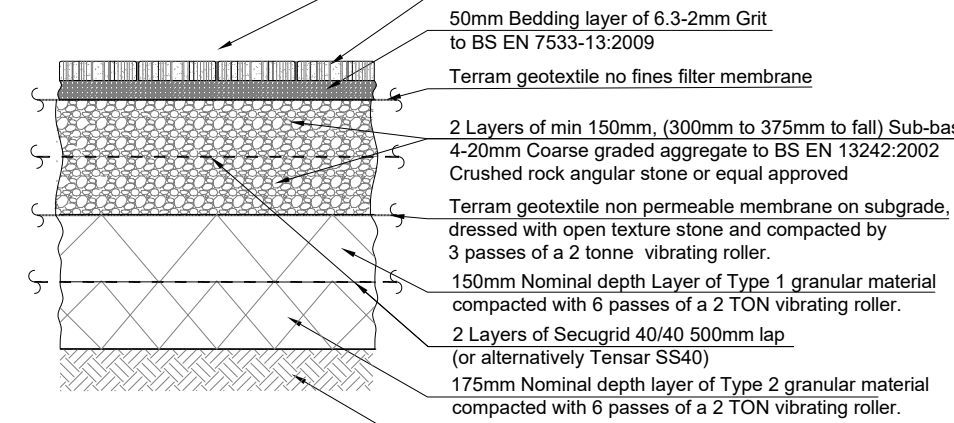
(Scale 1:20)



SPECIFICATION - F

TYPICAL BUILDUP DETAIL OF PERMEABLE PEDESTRIAN TERRACING AREA

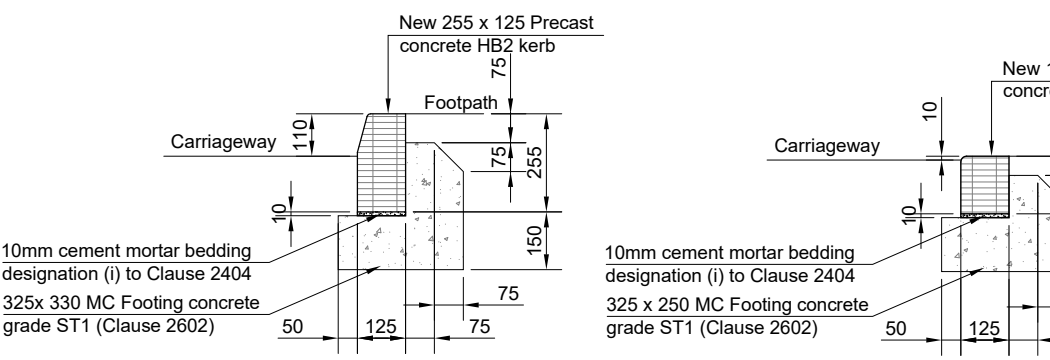
(Scale 1:20)



SPECIFICATION - G

TYPICAL BUILDUP DETAIL OF PERMEABLE PEDESTRIAN TERRACING AREA

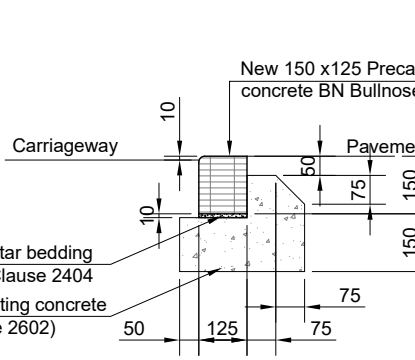
(Scale 1:20)



HALF BATTERED KERB DETAIL

(KD1)

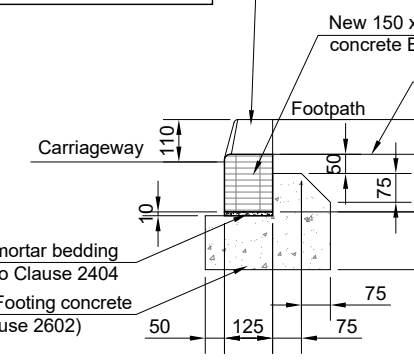
(Scale 1:20)



FLUSH KERB DETAIL

(KD2)

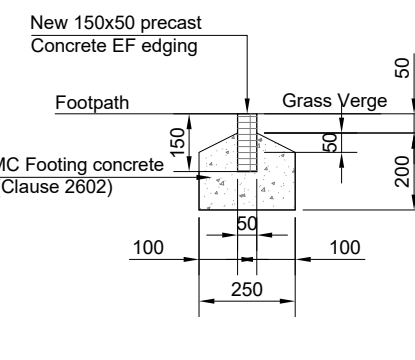
(Scale 1:20)



DROP KERB DETAIL

(DK3)

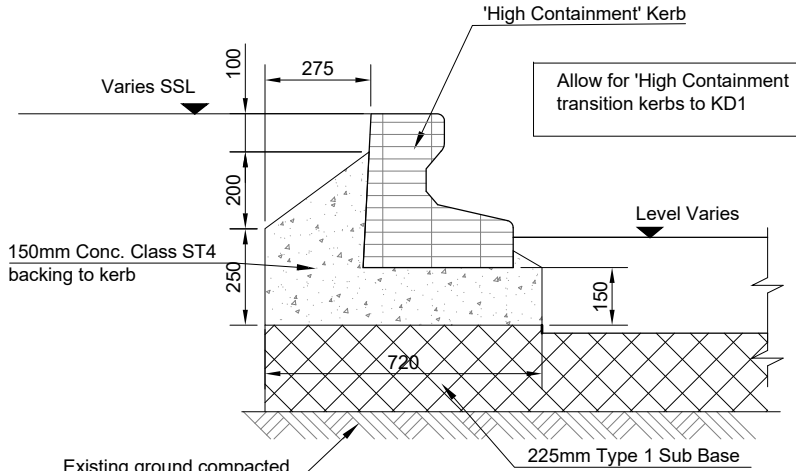
(Scale 1:20)



KERB EDGING DETAIL

(KD4)

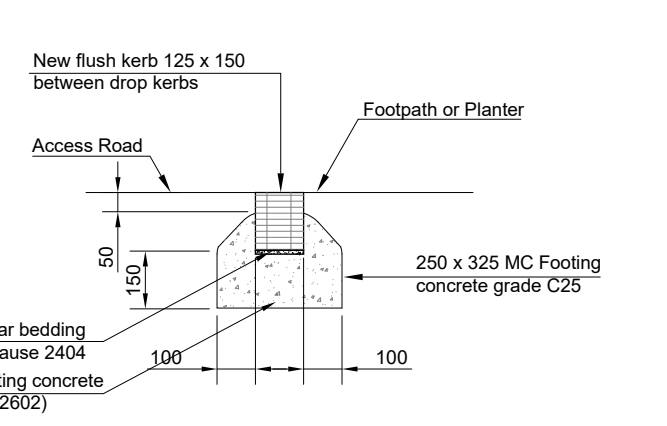
(Scale 1:20)



HIGH CONTAINMENT KERB DETAIL

(KD5)

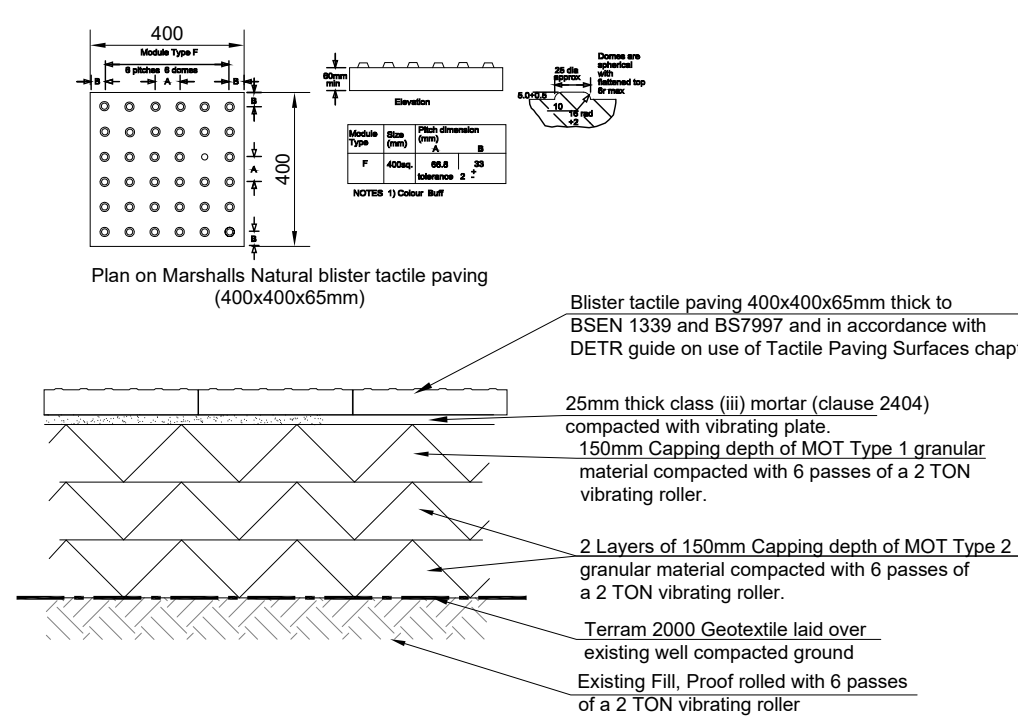
(SCALE 1:25)



DEMARICATION KERB DETAIL

(KD6)

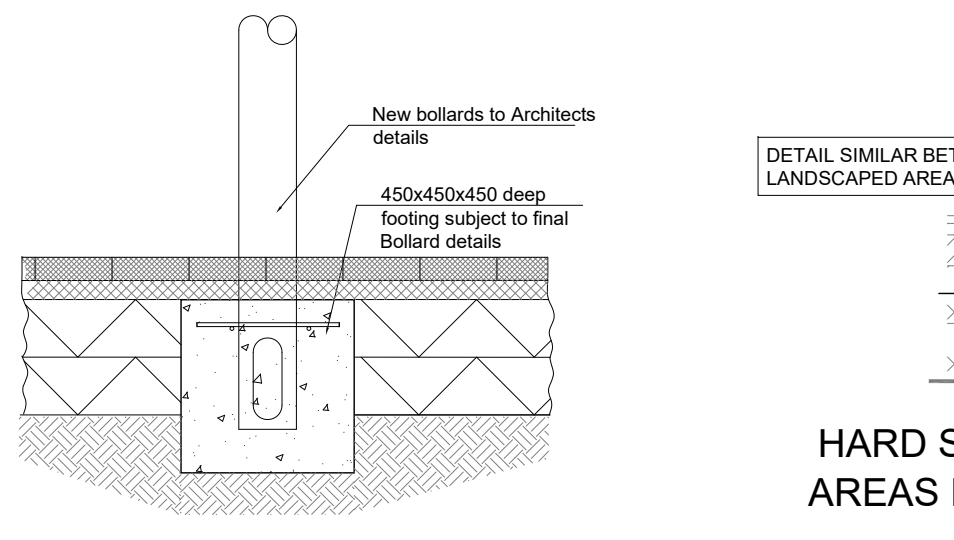
(Scale 1:20)



SPECIFICATION

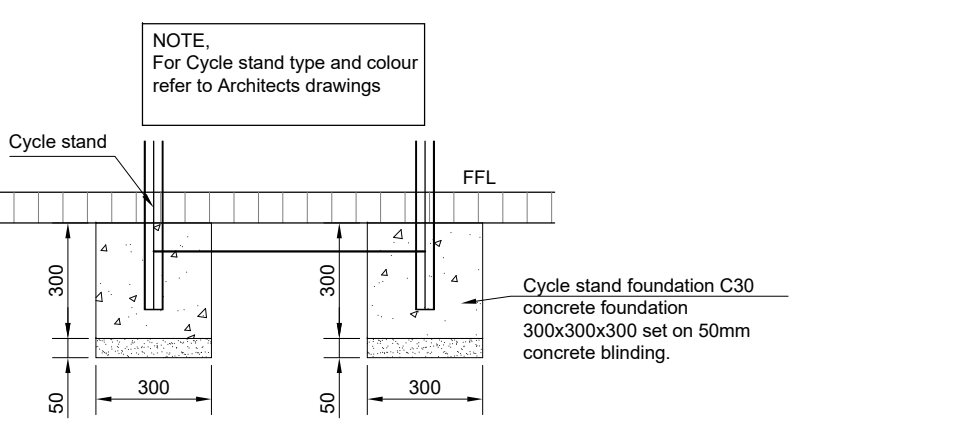
TYPICAL BUILDUP OF DETAIL OF BLISTER TACTILE PAVING

(Scale 1:20)



BOLLARD DETAIL

(Scale 1:20)



CYCLE STAND PAD FOOTINGS

(SCALE 1:20)

GENERAL NOTES

STEELWORK
All steelwork to be designed in accordance with BS EN 1993-1-1, 2005 unless stated otherwise, all steel shall be to BS EN 10025.
All structural steelwork is to be grade S355 except where noted otherwise
All steelwork is to be full profile and continuous, all end plates/capping plates are to be F.S.B.W. to RHS/CHS with plate edges prepared.
Following installation the steelwork shall be cleaned and prepared and any damage caused to the protective coating during construction shall be spot primed prior to final decoration.
Any connection shall be made using a minimum of 4no. M16 bolts or as specified on the drawings and details.
All bolts shall be grade 8.8.
All welds shall be 8mm fillet, except where specified otherwise.
All welds are to be full profile and continuous, all end plates/capping plates are to be F.S.B.W. to RHS/CHS with plate edges prepared.
All end plates/capping plates to be profiled to shape of section.
All end plates to be a laminar-free material.
For forced design loads refer to calculations and all connection shall be designed for the loads noted in SIMPSON TWS Calculation package.
At beam to column connections, the centre line of the column shall coincide with the centre line of the beam unless noted otherwise.
Steelwork built into masonry walls or in contact with masonry shall be painted with 3 coats of R/W or similar approved bitumastic paint.
All steelwork below ground to be encased in minimum 75mm structural grade concrete wrapped in D49 mesh.

FIRE PROTECTION
All structural steelwork requires a minimum protection period to be confirmed by Others
CONCRETE
The concrete used shall be as follows:
Concrete characteristic design strength at 28 days:
Blinding Grade C20
Reinforced concrete Grade C32/40
Mass concrete strip footings and pad foundations:
Crushing strength: 25 N/mm²
Minimum Cement Content: 280 kg/m³
Maximum Water Cement ratio: 0.55
Maximum aggregate size: 20mm
Foundations shall be taken to a firm bearing strata to the satisfaction of the Building Inspectors and Engineers.
All excavations are to be lined with blinding concrete or similar approved below specified formation levels or bottomed out in accordance with the specifications.
The integrity of the excavations is to be maintained by the contractor at all times.
All disturbed ground to be reinstated with granular fill in accordance with the specification and to the approval of the engineer.
Soft spots at new foundation levels are to be excavated and back filled with blinding concrete to the approval of the engineer.
The removal of excess water from the site is the responsibility of the contractor. The contractor must satisfy himself with respect to the ground water conditions on site & take measures to deal with the likely perched ground water conditions which exist.
Where existing redundant drains occur under new foundations and slabs they are to be grubbed out and back filled with mass concrete.
Reinforcement-grades:
High yield - grade 500 N/mm² (clause e30/150) (deformed type 2)
Plain bars - grade 250 N/mm² (clause e30/140).
Fabric - grade 500 N/mm² - (clause e30/210).
The minimum lap lengths to be as follows:
A393 MESH - 500mm
Loose bar reinforcement - 50 times the smaller bar diameter
Unless noted otherwise concrete cover to outermost reinforcement to be:
40mm against blinding, 35mm all other faces
LOAD BEARING MASONRY
The following materials where specified are to have a minimum average compressive strength of:-
Engineering brickwork, 50N/mm²
Common brickwork, 20 N/mm²
Mortars shall be as follows 1:3 (cement: sand) below DPC level and 1:1:6 (cement: lime: sand) above DPC level.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS & SUB-CONTRACTORS DRAWINGS AND DETAILS AND THE PROJECT SPECIFICATION. WHERE ANY DISCREPANCY MAY EXIST BETWEEN THESE NOTES & THE SPECIFICATION, THE SPECIFICATION SHALL PREVAIL.
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P1	ISSUED FOR PLANNING CONDITION 6	GB	11.06.26
T1	ISSUED FOR TENDER	GB	13.05.26
MK	REVISION	BY	DATE

ISSUE

PROPOSED EXTERNAL WORKS DETAILS

PROJECT

STARBUCKS POD,
SCOURS LANE,
TILEHURST,
READING, RG30 6AX



London, Henley-on Thames and Gloucester

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Purpose of Issue

ISSUE

Project Number P24-0805

Drawing Number EW02

Revision P1

APPENDIX C - PRODUCT DATA

- HYDRO INTERNATIONAL HYDRO BRAKE FLOW CONTROL ATTENUATION RESTRICTOR OPERATION AND MAINTENANCE MANUAL
- POLYPIPE POLYSTORM MODULAR UNITS AND INSTALLTION DETAILS
- CELLWEB INSTALLATION DETAILS

Hydro-Brake® Vortex Flow Control

Reduce Storage Needs by Controlling Flow.

Product Profile

The Hydro-Brake® Vortex Flow Control is a versatile, self-activating device with a unique geometry designed to harness the energy of vortex flow.

The Hydro-Brake® is used to maximize savings on new construction projects by minimizing stormwater detention volumes. Also an economical retrofit solution, the Hydro-Brake® can be installed in over-discharging ponds and catch basins to restrict the outflow without requiring the construction of additional detention volumes.

With large openings that guard against blockages and an installation base upwards of 25,000 units, the Hydro-Brake® is a trusted and proven solution used to reduce the rate of stormwater runoff.

How it Works

The Hydro-Brake® operates on simple fluid hydraulics. Flow enters the volute tangentially through the inlet. Under low flow conditions, the Hydro-Brake® acts as a large orifice and water passes directly from the inlet to the outlet (Fig.1a).

As flow increases and reaches the Flush-Flo™ point, high peripheral velocities initiate the throttling action. As head increases, the valve approaches the Switch-Flo™ and Kick-Flo™ points and an air-filled core starts to form in the volute. As head continues to increase, the air core fully stabilizes and the valve discharge is throttled to that of a smaller orifice (Fig.1b).

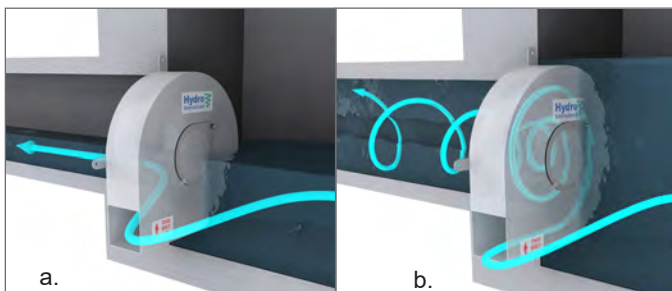


Fig.1 The Hydro-Brake® operates like (a) a large orifice under low flow conditions, and (b) a small orifice under higher flow / higher head conditions when a vortex air core forms within the device and throttles the flow.

Applications

- Outlet flow control for stormwater detention
- Outlet flow control for dams and flood reservoirs
- Reduction of runoff volume from sites
- “Blue roof” stormwater detention schemes
- Erosion control and energy dissipation

Advantages

- Reduced stormwater storage volumes by up to 40%
- Up to 50% savings in project storage costs
- Self-activating with no moving parts or power requirements
- Available in wall-mounted or floor-mounted geometries
- Area of opening is 3-6 times larger than the equivalent orifice
- Virtually maintenance free
- Proven performance with over 25,000 installations worldwide

The Hydro-Brake® Vortex Flow Control optimizes flow control to allow for higher discharge rates at lower heads than conventional flow control options. The head/discharge curves shown below illustrate the behavior of a Hydro-Brake® Vortex Flow Control compared to an orifice (Fig.2).

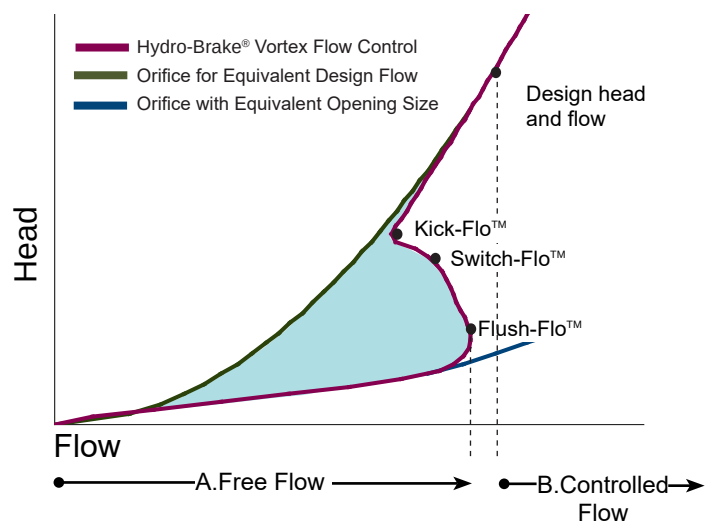


Fig.2 The characteristic of the Hydro-Brake® vs. an equivalent orifice.

Hydro-Brake® Vortex Flow Control

Sizing & Design

Three series of Hydro-Brake® Vortex Flow Controls are available to suit various applications and design constraints. Refer to the Hydro-Brake® Design Chart for typical sizing guidelines (Table 1).

Table 1. Hydro-Brake® Vortex Flow Control design chart.

Series	S Series	V Series	C Series
Typical Geometry			
Models	SH STH SXH SMH SMXH	SV SXV SMV	C CX CH
Typical Applications	- Flow control at the inlet of the storm drain system - Outlet flow control for stormwater detention systems	- Erosion control & energy dissipation - Roof runoff control for "Blue Roof" detention schemes	- Outlet flow control for flood dams and levees - Outlet flow control for stormwater detention systems
Typical Mount Style	Wall Mount	Downspout/Roof Mount Floor Mount Pipe Mount	Floor Mount
Typical Diameter Range*	2 - 16 in (5 - 41 cm)	2 - 16 in (5 - 41 cm)	3 - 20 in (7.5 - 51 cm)
Typical Flow Range**	0.05 - 5.6 cfs (1 - 157 L/s)	0.05 - 6.0 cfs (1 - 174 L/s)	0.18 - 14.3 cfs (5.3 - 405 L/s)

*Listed diameter ranges are typical guidelines only. Hydro-Brake® Vortex Flow Controls can be manufactured to any specified diameter up to 6'.

**Flow ranges listed are for 4' - 6.5' of head.

Contact Hydro International for site-specific sizing and design requirements.

Optional Design Accessories

Pivoting Bypass Door



For maintenance access to the outlet pipe.

Curved Backplate



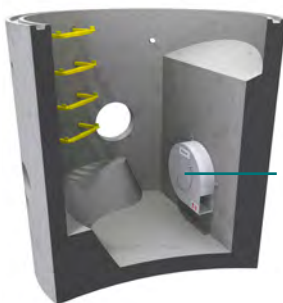
To allow for flush-mounting to the wall of a round manhole.

Vortex Suppressor Pipe

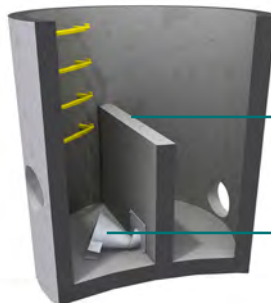


To eliminate air core for emergency bypass.

Typical Chamber Configurations



Wall Mounted SXH Model for Catch Basin Inlet Control



Large Storm Bypass Weir
Floor Mounted CH Model for Small Storm Flow Control



Pipe Mounted SXV Model for Energy & Velocity Dissipation

Performance Verification of Very Fine Sediment Removal with 50-Micron Silica Sand

The Downstream Defender® is an advanced Hydrodynamic Vortex Separator that removes sediment, oil and floatables from stormwater runoff. It has flow modifying internal components to stabilize the flow regime within the device, providing higher pollutant removal capabilities and protection from high scour velocities during intense storm events (Fig.1).

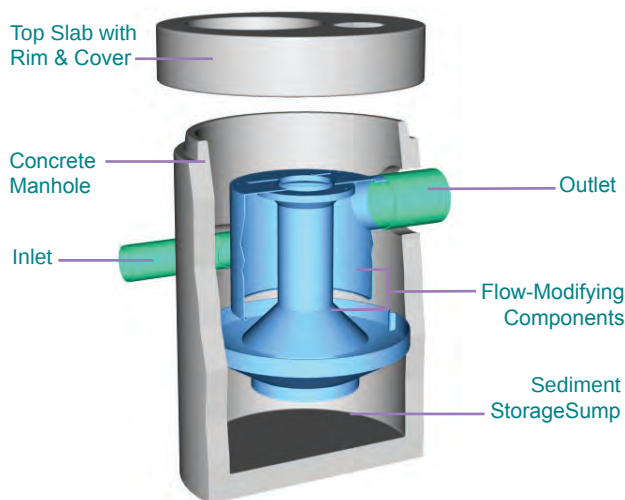


Fig.1 The flow modifying components stabilize the flow regime to provide higher pollutant removal capabilities.

Verification of Fine Sediment Removal

Although runoff from intense storm events has enough energy to mobilize large pollutants such as trash and coarse sediments, small storm events tend to mobilize very fine sediment. To evaluate the ability of the Downstream Defender® to capture these pollutants, a full-scale 4-ft diameter unit was tested under controlled laboratory conditions (Fig.2).

Test procedures were based on requirements to obtain General Use Level Designation (GULD) for Pretreatment by the Washington Department of Ecology (WA DOE) and a Certificate of Technology Assessment under the New Environmental Technology Evaluation (NETE) Program by the Ontario Ministry of the Environment.

Clean water from a 23,000 gal reservoir was pumped to the Downstream Defender® for 4 test runs with target flow rates of 0.4 cfs to 2.2 cfs with no bypassed flows, and inlet concentrations of 200 to 300 mg/L (Fig.3). A very fine gradation of test sediment was produced by mechanically sieving U.S. Silica

grade F-110 sand with a #200 sieve to ensure that all test sediment was less than 75-micron with an approximate mean particle size of 50-micron.

Five influent and effluent grab samples were collected per test run, for a total of 18 sample pairs. All samples were analyzed for Total Suspended Solids (TSS) by APHA SM2540D. Background influent and effluent samples were analyzed to ensure the reservoir supplied clean water. The average removal efficiency was calculated for each flow rate.

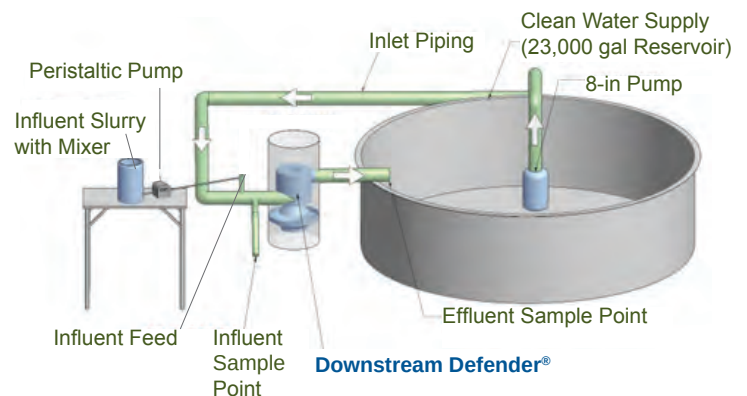


Fig.2 Hydro International's Portland, Maine test facility.



Fig.3 Grab samples were taken from the effluent discharge (pictured, left) and the influent to determine removal efficiency.

Downstream Defender®

Performance Testing Results

Test data demonstrates 80% removal of very fine sediment for all flows up to 1.2 cfs (Fig.4). As the Downstream Defender® does not incorporate an internal bypass, it will continue to capture sediment as flows increase. Whereas internally bypassing units will begin to discharge higher flows without any treatment, the test results project that the Downstream Defender® will continue to provide positive removal efficiencies up to its Peak Treatment Flow Rate of 3 cfs (Fig.4).

These results confirm the efficiency of the Downstream Defender® over the wide range of tested flow rates and highlight the benefit of internal components that stabilize the flow regime and prevent bypassing of untreated flow.

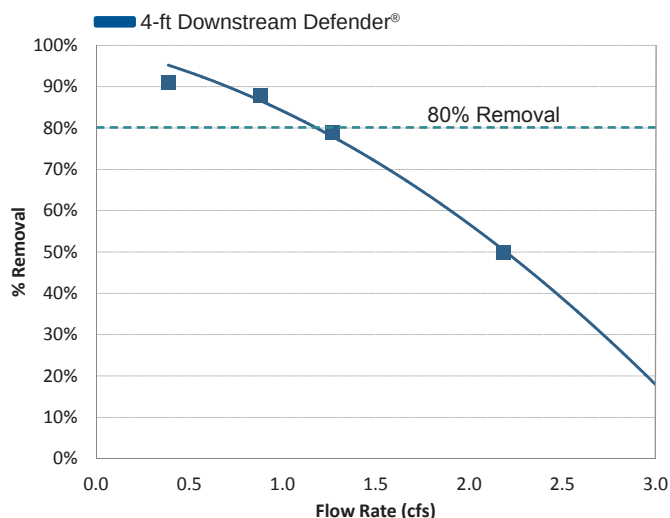


Fig.4 Results of the testing show 80% removal of the very fine test sediment up to 1.2 cfs.

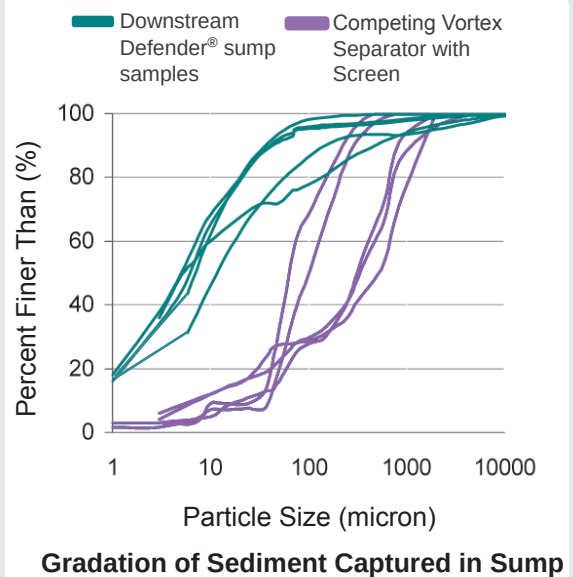
Downstream Defender® Sizing

Flow rates for the 6, 8, 10 and 12-ft diameter Downstream Defender® models for 80% removal of 50-micron sediment are shown in the table below.

Model Unit Diameter	Treatment Flow Rates (80% Removal)	Peak Treatment Flow Rates
(ft)	(cfs)	(cfs)
4	1.2	3.0
6	3.4	8.0
8	6.9	15.0
10	12.1	25.0
12	19.0	38.0

Field Samples Confirm Fine Sediment Removal Performance

The results from the 50-micron sediment removal laboratory testing are consistent with observations from field sampling of Downstream Defender® sump material at many different sites. Sediment captured and retained in the sumps of various Downstream Defender® installations has been shown to be significantly finer than the sediment captured and retained in other stormwater treatment chambers (Faram et al., 2007)¹. This observation has been corroborated from comparing particle size distributions of sediments captured in a competing vortex separator installed at sites with equivalent land use. In most cases, at least 80% of the material in the Downstream Defender® sump samples was 20-micron or finer. Sump samples from the competing vortex separator showed much less capture and retention of fine material, with only 10 - 18% of sump material in the range of 20-micron or finer.



References

1. Faram, M. G., Iwugo, K.O. and Andoh, R.Y.G., 2007, "A Field Study of Sediments Captured by Flow-Through Stormwater Interceptors", Novatech: 6th International Conference on Sustainable Techniques and Strategies in Urban Water Management, Lyon, France, 25-28 June, pp 641-648.



WMS

Polystorm Lite and Polystorm

Installation Guide

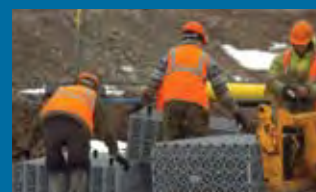
Water Management Solutions

Installation Guidelines

Installation

A full-page photograph showing two construction workers in white hard hats and high-visibility vests installing a geogrid system on a hillside. The workers are positioned on a grid of black plastic geogrid with circular openings. Several black plastic pipes are visible, some standing upright and others lying flat, used to secure the geogrid. The background shows a steep, eroded brown soil bank under a cloudy sky.

The following section outlines site best practise for the installation of Polystorm Lite and Polystorm.



Installation for Attenuation Systems

5. Installation

5.1 Installation details

5.1.1 Health and Safety

Under the Construction (Design and Management) Regulations 2007, unless they are a domestic client, all parties involved in construction or building work have legal duties. These include:

Clients

- Check competence and resources of all appointees
- Ensure there are suitable management arrangements for the project welfare facilities
- Allow sufficient time and resources for all stages
- Provide pre-construction information to designers and contractors

Designers

- Eliminate hazards and reduce risks during design
- Provide information about remaining risks

Contractors

- Plan, manage and monitor own work and that of workers
- Check competence of all their appointees and workers
- Train own employees
- Provide information to their workers
- Comply with the specific requirements in Part 4 of the Regulations
- Ensure there are adequate welfare facilities for workers

It should be noted that additional legal duties are imposed where construction work is notifiable.

All installation activities should be carried out observing the requirements of The Health and Safety at Work Etc. Act 1974; and The Management of Health and Safety at Work Regulations 1999.

Polystorm Benefits for CDM Compliance

Storage applications using Polystorm Water Management Systems are actually beneficial to CDM compliance. This is because the system

avoids or reduces several risks associated with the construction of traditional storage tanks which can involve deep excavations and construction of large engineered structures. Specific advantages of Polystorm in this respect are:

- Individual Polystorm components are lightweight – making it easier for individual lifting of Polystorm cells.
- Installation of Polystorm is quick – so open excavation time is minimised and high numbers of manpower and machinery is reduced.

5.1.2 Risk Assessment

Contractors are required to submit a method statement which includes a methodology for installation and risk assessment for the work to be carried out.

5.1.3 Site Guidance

Good Practice Guide

The following are good practice principles for the handling and storage of all Polystorm cells on site:

- Store units away from direct sources of heat including sunlight for excessive periods
- Place packs of cells on level ground:
DO NOT stack filled pallets on site
- Store loose individual cells
NO MORE THAN 5 cells high
- Ensure a well positioned and secure stand for platform issued to remove the top layer of Polystorm cells from the pallet
- Although Polystorm cells contain an inhibitor giving ultra violet resistance for up to 6 months, avoid prolonged storage in direct sunlight
- DO NOT store cells near fuel bowsers, fuel tanks or any other solvents
- Although Polystorm cells are very robust and resistant to damage when handled normally, store in locations where impacts from vehicles and site plant will be avoided
- Ensure Polystorm cells are kept clean at all times

- Broken/cracked cells should not be installed. Broken/cracked cells should be recycled wherever possible
- Individual Polystorm Lite cells weigh 7kg and Polystorm 9kg so they can normally be safely lifted on site in accordance with current manual handling regulations.
- Avoid walking on the geosynthetic membrane to reduce risk of puncturing or tearing the textile
- Care must be taken when placing the cells into the excavation
- Install 1st layer of cells to minimise walking on the geomembrane textile

5.1.4 Floatation

When placed below the ground water table as an attenuation system (i.e. wrapped in a geomembrane) there is a risk that the buoyancy of a tank may cause it to float. This can be prevented by placing a sufficient weight of soil on top of the tank to counteract the upward forces. Our Technical Team can assist with groundwater calculations. Please contact Polypipe WMS technical support team. Also see section 4.

5.1.5 Excavation and Preparation

Excavate to the required plan dimensions and level, ensuring that the excavation orientation will allow easy installation of connecting pipework. Consideration should be given to maintaining construction plant access for reinstating around the installed Polystorm cells.

Ensure that the ground bearing capacity at the formation level is sufficient for the proposed operational loads. The base of the excavation should be smooth and level, free of large or sharp stones and soft spots to avoid punctures or tears of the geomembrane. Any soft spots should be excavated and replaced with suitable compacted granular material.

Place and compact a minimum 100mm thick layer of bedding material (typically coarse sand). If required, line the base and sides of the excavation with a protective geotextile before placement of the impermeable geomembrane. Excavation should be carried out in accordance with BS6031, paying particular attention to safety procedures.

5.1.6 Handling and Installation

All materials used should be checked before and after installation for any damage such as punctures or tears to the membrane.

The type of geosynthetic material used to encapsulate the Polystorm cells will determine the installation requirements. Please note the following information is generic and advice from the geosynthetic manufacturer should be sought to ensure that the appropriate protective measures are taken to comply with any proprietary requirements.

Physical Properties		
Thickness	Min 0.75 to 1.0mm	ASTM D5199
Density	900 kg/m ³	ASTM D1505
Mechanical Properties		
Tensile strength, at yield	Min 1600kN/m ²	ASTM D4885
Elongation at break	>500%	ASTM D4885
Puncture resistance	Min 170N	ASTM D4833
Tear resistance	Min 67N	ASTM D1004 Die C
Impact resistance	Min 15 Joules	ASTM 3998 mod
Stress crack resistance	Min 200 hrs	ASTM D5391 (SP-NCTL)
Permeability coefficient	Max 2.0 x 10 ⁻¹²	ASTM D
pH	Resistant to all naturally occurring soil acids and alkalis	
Chemical/biological resistance	Resistance to all substances found to naturally occur in soils and rainwater. Detailed information would need to be provided to geomembrane manufacturer in instances of contaminated land.	

Table 5-1 Impermeable Geomembrane

Before cells are installed a geomembrane should be laid over the subgrade level. Positioning of sheeting is undertaken by machinery or hand. After unrolling the sheeting, its position is adjusted so that a suitable overlap is achieved for the welding process. Before welding, the sheet must be checked for any damage including punctures or tears. If damage has occurred re-patch the damaged area with additional geomembrane material and weld over damaged area. Ensure the damaged area is overlapped by a minimum of 400mm.

Joint each sheet of geomembrane together according to the suppliers' recommendations.

Installation for Attenuation Systems

Polystorm Cell Installation

Before proceeding with the installation please ensure you carefully read and understand the Good Practise Guidelines stated earlier in the document.

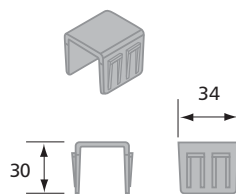
Ensure cells are arranged so that they are in the correct alignment with the adjoining pipework. Wherever possible, minimise the amount of walking on the geomembrane to reduce the chances of punctures or tears to the material by laying the first layer of cells.

5.1.7 Connecting Polystorm Cells

Place the Polystorm cells on the geomembrane in accordance with the construction drawings. Ensure the Polystorm cells are abut and the corners align with each other. During installation, Polystorm cells should be securely connected using clips and shear connectors. Clips and shear connectors are supplied in sealed polythene bags of 60 and 30.

Clip Connectors

Polypipe clips connect horizontally adjacent units.



Shear Connector

Vertical connections are formed with the Polypipe shear connector.

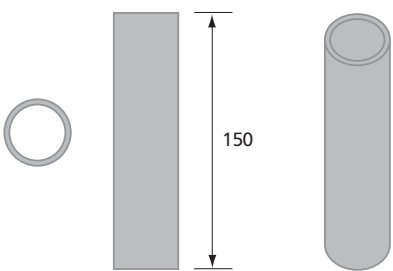


Figure 5-2 Clips and shear details

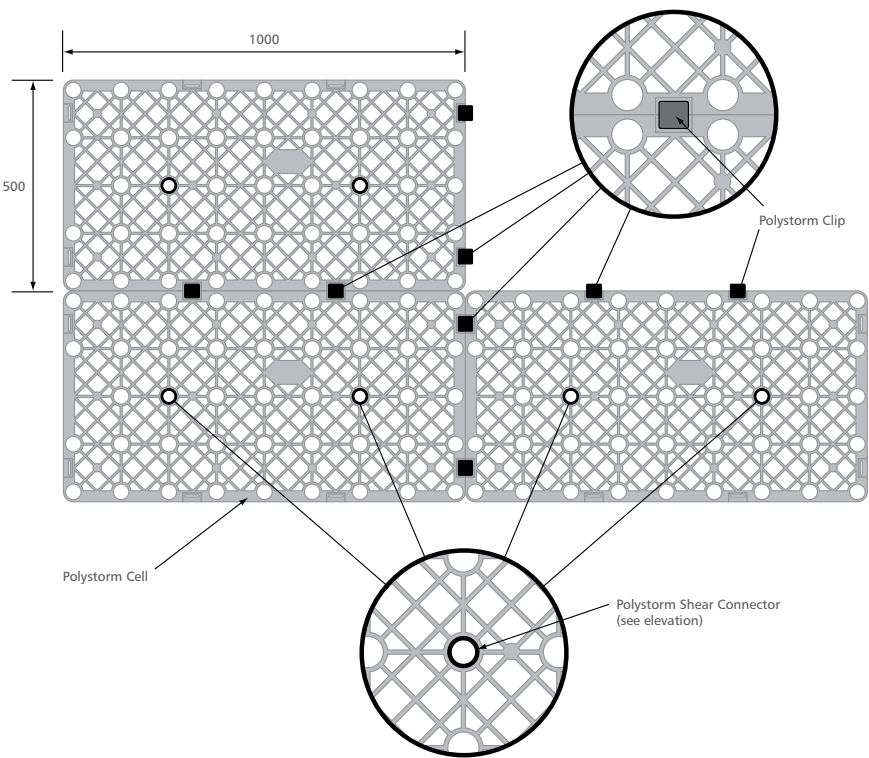


Figure 5-3 Location points for clips and shears