

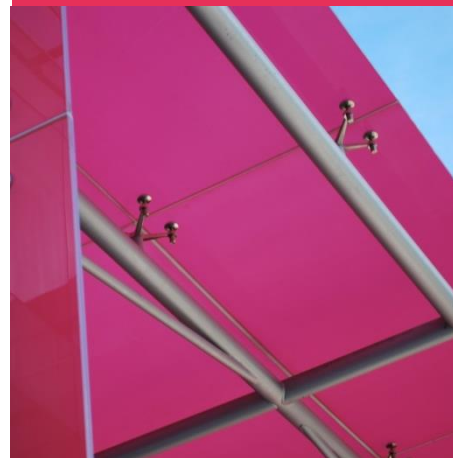
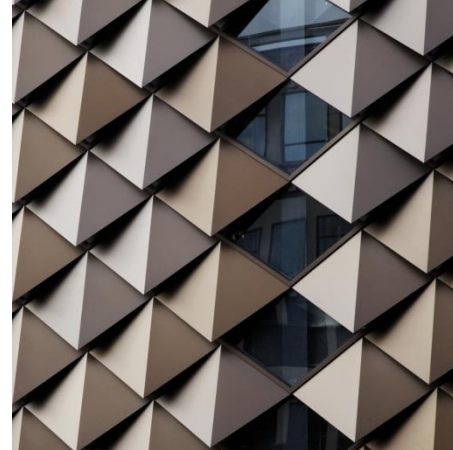
Building 78, Circle Square

Implementation, Maintenance and Management of the SuDS

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Control Sheet

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins with respect to the information contained in the report will not extend to any third party.

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Revisions

Revision	Date/ by	Description of Revision
V01	12/05/20	Issued for Approval

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Appendix A

As Built Contractor Information

Appendix B

Manufacturers Details (SuDS)

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1.0 SuDS Verification

The surface water discharge from this building is part of a site wide strategy. Refer to The Flood Risk Assessment referenced ICMA0040/FRA/P1B Rev A for details in relation to Flood Risk, Flooding and Flood Compensation.

The measures we have provided within the site drainage are as directed by NPPF, technical guidance and covered within the WFD and are as follows:

- Reduce surface water run-off - As recommended by the Environment Agency, Manchester Lead Local Flood Authority and the Greater Manchester Strategic Flood Risk Assessment; surface water run-off should be restricted to 50% of pre-development flows. A model of the existing drainage has been created to assess the pre-development run-off rates. The proposed development run-off has been restricted to 50% (including allowance of 30% for climate change) by flow controls and then introduction of sustainable drainage systems and attenuation facilities.
- Surface Water has been managed at its source where practical to do so and this has been demonstrated by the introduction of a green roof area, and filter drains.
- Water Quality- A minimum of one stage of treatment is provided for all areas within the site and a two-stage treatment has been proposed for all areas subject to vehicles.

The measures which have been specified to implement within Building 78 plot are:

- A filter chamber has been specified prior to outfall (Naylor Smart Filter; all surface water drainage will pass through this chamber and provides one stage of treatment.
- Green roof construction (Permaquick) to the roof of Building 78; specified as a Sedum blanket, which typically holds up to 5 litres per m² (5mm).
- Natural stone and precast concrete paving areas are drained to filter drains comprising of single sized stone with approximately 30% void ratio; this system provides one stage of treatment.

The following photographs are the SuDS features which are off plot but are serving Building 78:

- Attenuation Tank
- Hydrobrake Flow Control Device
- Smart Filter Chamber
- Filter Drains

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Attenuation Tank

ESS Ltd Pluvial Cube



Alderburgh Geotex Geotextile



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Flow Control (Manhole SA26- Outfall into Oxford Road)

Hydro-Brake Flow Control

Hydro-brake Optimum MD-SHE-0334-6250-0700-6250.



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Filter Chamber (Manhole Outfall into Charles Street)

Naylor Smart Filter SF03.2B



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The following photographs are the SuDS features which are on plot:

- Green Roof

Green Roof (IKO Green, Extensive Sedum Blanket Green Roof)



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2.0 Maintenance

- 2.1.1 This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.
- 2.1.2 The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.
- 2.1.3 The surface water network has been designed to accommodate the 1 in 100 year storm rainfall event plus an allowance for climate change particular to the requirements of the site. It may be that the exceedance flows above the 1 in 30 year storm rainfall event are stored within the site partially above ground, on non-habitable external landscaping, parking or other space. As the flows are generally being attenuated on site and within SuDs features there will be a period of time after storm events where the network is still partially or fully surcharged and is draining down. Where this surcharging is still present after 48hrs appropriate action should be taken as noted in this section.

2.2 Components

- 2.2.1 The following components have been included within the drainage design for the proposed development:
- Inspection, Manhole and Catchpit Chambers
 - Pipes
 - Drainage Channels and Gullies
 - Filter Drains
 - Attenuation Tank
 - Flow Control Unit
 - Smart Filter
 - Green Roof Area
- 2.2.2 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 2.2.3 It is assumed that the maintenance of the drainage network will be the responsibility of an on-site facilities management team, however Manchester City Council may adopt the sustainable drainage features proposed.
- 2.2.4 A copy of the final construction drainage layout will be provided in the final Operations and Maintenance Manual.

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- 2.2.5 The surface water network has been designed to accommodate the 1 in 100 year storm rainfall event plus an allowance for climate change particular to the requirements of the site. It may be that the exceedance flows above the 1 in 30 year storm rainfall event are stored within the site partially above ground, on non-habitable external landscaping, parking or other space. As the flows are generally being attenuated on site and within SuDs features there will be a period of time after storm events where the network is still partially or fully surcharged and is draining down. Where this surcharging is still present after 48hrs appropriate action should be taken as noted below.
- 2.2.6 It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- 2.2.7 Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.
- 2.2.8 Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.
- 2.2.9 During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris or litter
- 2.2.10 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

2.3 Inspection, Manhole and Catchpit Chambers

- 2.3.1 The locations of the Inspection Chambers, Manholes are indicated on Curtins drainage drawings enclosed in Appendix A
- 2.3.2 Access points have been located at the head of each run, at a change in direction and at a change of pipe size in accordance with Building Regulations Part H.
- 2.3.3 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access.

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2.4 Pipes

- 2.4.1 The locations of the drainage pipes are indicated on Curtins drawings enclosed in Appendix A
- 2.4.2 Pipes are proprietary products and the materials can vary across the site and as such where used the manufacture's recommendations should be followed. Regardless of the product used the pipes will be fully compliant with the Curtins drainage specification.
- 2.4.3 Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.
- 2.4.4 Access for maintenance is provided through access chambers and manholes.
- 2.4.5 Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be drainage correctly thus exposing the development to a greater level of flood risk.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection should be provided as post construction CCTV survey.	N/A
Regular maintenance\ inspection	Inspect for evidence of poor operation via water level in chambers. If required take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
Remedial Action	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

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2.5 Drainage Channels and Gullies

- 2.5.1 The locations of the drainage channels and gullies are indicated on Curtins drainage drawings enclosed in Appendix A
- 2.5.2 Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.
- 2.5.3 Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating.
- 2.5.4 Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the car park channels.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection including channel outlet boxes.	Half yearly and after large storms.
Regular maintenance\ inspection	Litter and debris removal	Monthly or as required.
	Check and remove large vegetation growth near channel runs.	Monthly or as required
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or berm adjacent to the paving.	3-monthly, 48 hours after large storms.
Remedial Action	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial remediation.	As required.

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2.6 Filter Drains

- 2.6.1 The locations of the filter drains are indicated on Curtin's drainage drawings enclosed in Appendix A.
- 2.6.1 The filter drains are intended for surface water conveyance, water quality and attenuation storage features.
- 2.6.2 Access for maintenance has been provided through access chambers and rodding points.
- 2.6.3 Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection including incoming channel outlet boxes.	Half yearly and after large storms.
Regular maintenance\ inspection	Litter and debris removal	Monthly or as required
	Remove sediment from pre-treatment structures.	Monthly or as required
Remedial Action	Replace geotextiles and clean and replace filter media, if clogging occurs. Terram 1000 typical design life is 25 years.	As required.
	Excavate trench walls to expose clean soils if infiltration performance reduces to unacceptable levels.	As required.

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2.7 Attenuation Tanks

- 2.7.1 The locations of the attenuation tanks are indicated on Curtin's drainage drawing CS-CUR-ZZ-0G-DR-C-90002, refer to Appendix A.
- 2.7.2 The attenuation tanks are geocellular units and are intended for storage of surface water run-off from the site up to and including the 1 in 100 year plus 30% climate change event to reduce the rate of run-off into the downstream network and to minimise flood risk.
- 2.7.3 The geocellular units are proprietary products and therefore manufacturer's recommendations should also be taken in to consideration.
- 2.7.4 Access for maintenance has been provided by an access shaft located on the tank and from the manhole chambers downstream of the tank.
- 2.7.5 Regular inspection and maintenance is important for the effective operation of attenuation tanks as designed. As the feature is buried, a regular inspection regime is very important to ensure the correction functionality of the surface water drainage network.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets, outlets and overflows.	As required.

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2.8 Flow Control Units

- 2.8.1 The locations of the smart filter are indicated on Curtin's drainage drawings CS-CUR-ZZ-0G-DR-C-90002, refer to Appendix A.
- 2.8.2 The flow control units are intended for flood control and flow restriction.
- 2.8.3 The flow controls are specified as Hydro-brake or similar approved and are proprietary products; therefore manufacturer's recommendations should also be taken in to consideration.
- 2.8.4 Access for maintenance has been provided by locating within manhole chambers.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures and flow control chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets.	As required.

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2.9 Smart Filter

- 2.9.1 The locations of the smart filter are indicated on Curtin's drainage drawings CS-CUR-ZZ-0G-DR-C-90002, refer to Appendix A.
- 2.9.2 The smart filters are intended for a second or third stage treatment for water quality.
- 2.9.3 The Smart Filters are proprietary products and therefore manufacturer's recommendations should also be taken in to consideration.
- 2.9.4 Access for maintenance has been provided by locating within manhole chambers.
- 2.9.5 Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the chamber containing smart filters.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets and outlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures and filter chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets/outlets.	As required.

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2.10 Green Roof

- 2.10.1 The green roof is located on Building 78, and is shown on the Architect's drawings
- 2.10.2 The green roof is intended as a first stage treatment for water quality, and also as attenuation for surface runoff.
- 2.10.3 The Smart Filters are proprietary products and therefore manufacturer's recommendations should also be taken in to consideration.
- 2.10.4 Access for maintenance has been provided by locating within manhole chambers.
- 2.10.5 Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the chamber containing smart filters.

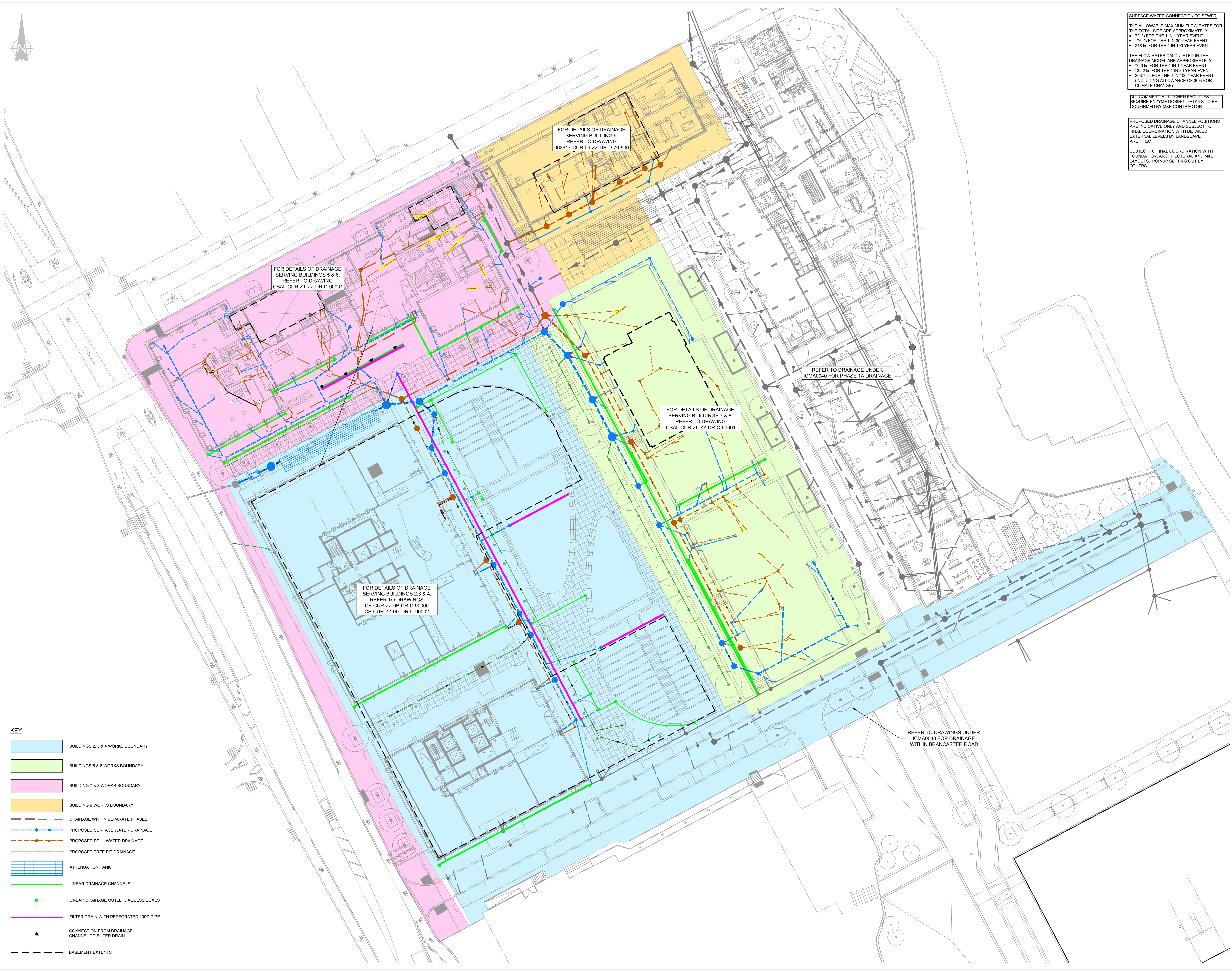
Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets and outlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures and filter chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets/outlets.	As required.

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Appendix A

Curtins Drainage Drawings



1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS

- | | | | | |
|-----|--------------------|----------|-----|-------|
| P02 | MASTERPLAN UPDATED | 14.11.18 | ATL | |
| P02 | MASTERPLAN UPDATED | 09.07.18 | ZG | CG |
| P01 | FIRST ISSUE | 14.09.17 | ATL | CG |
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Status:

INFORMATION

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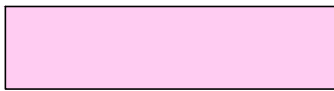
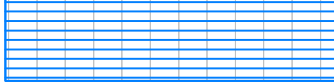
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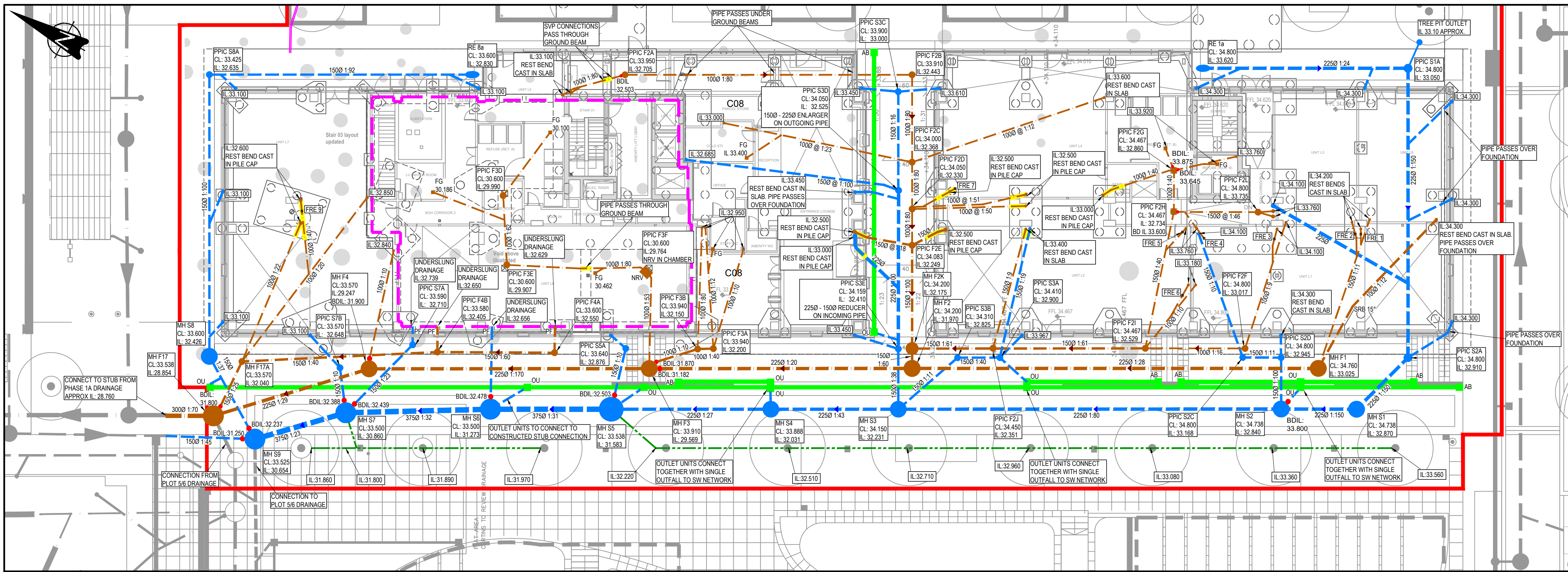
Dwg Title:

DRAINAGE MASTERPLAN

Size	Date	Drawn By	Designed By	Checked By			
A0	14.09.17	ATL	ATL	CG			
Scale: 1/250							
Project No	Originator	Zone	Level	Type	Discipline	Category / Number	Rev
063401 - CUR - 00 - ZZ - DR - C - 92-500 - P-03							

5

- | | |
|--|--|
|  | BUILDINGS 2, 3 & 4 WORKS BOUNDARY |
|  | BUILDINGS 5 & 6 WORKS BOUNDARY |
|  | BUILDING 7 & 8 WORKS BOUNDARY |
|  | BUILDING 9 WORKS BOUNDARY |
|  | DRAINAGE WITHIN SEPARATE PHASES |
|  | PROPOSED SURFACE WATER DRAINAGE |
|  | PROPOSED FOUL WATER DRAINAGE |
|  | PROPOSED TREE PIT DRAINAGE |
|  | ATTENUATION TANK |
|  | LINEAR DRAINAGE CHANNELS |
|  | LINEAR DRAINAGE OUTLET / ACCESS BOXES |
|  | FILTER DRAIN WITH PERFORATED 1000 PIPE |
|  | CONNECTION FROM DRAINAGE CHANNEL TO FILTER DRAIN |
|  | BASEMENT EXTENTS |



NOTE
LOCATION OF STEPS UNDER REVIEW.
TBC BY LANDSCAPE ARCHITECT.

- KEY**
- INDICATIVE PLOT BOUNDARY
 - EXTENT OF BASEMENT
 - PROPOSED SURFACE WATER DRAINAGE
 - PROPOSED FOUL WATER DRAINAGE
 - EXISTING DRAINAGE FROM SEPARATE PHASES
 - BACKDROP CONNECTION
 - PUDDLE FLANGE FITTED TO OUTLET OF UNDERSLUNG DRAINAGE THROUGH RETAINING WALL
 - GATIC PAVESLOT 100 CHANNEL OR SIMILAR APPROVED
 - GATIC ACCESS BOX OR SIMILAR APPROVED
 - GATIC OUTLET UNIT OR SIMILAR APPROVED
 - SURFACE WATER RODDING EYE
 - FOUL INTERNAL RODDING EYE
 - PROPOSED 100mm PERFORATED TREE PIT DRAINAGE
 - PROPOSED FLOOR GULLY
 - CONNECTIONS TO BE CAST IN BASEMENT SLAB

INTERNAL FOUL RODDING EYE INFORMATION				
REF	CL	IL	EASTING	NORTHING
FRE1	34.800	34.050	384320.055	397363.127
FRE2	34.800	34.050	384319.864	397363.486
FRE3	34.800	34.020	384317.044	397368.632
FRE4	34.800	34.200	384314.222	397373.248
FRE5	34.467	33.700	384313.988	397374.861
FRE6	34.467	33.100	384309.85	397372.681
FRE7	34.010	32.530	384308.938	397391.218
FRE8	REMOVED			
FRE9	33.600	32.580	384284.311	397431.853
RODDING EYE TO SUIT 1000 PIPEWORK				
ACO RODDING EYE, REF 104010 WITH ACO DOUBLE SEALED COVER, REF 105054 OR SIMILAR APPROVED.				

GENERAL NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
- ALL DRAINAGE WORKS TO BE IN ACCORDANCE WITH THE CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (CESWI) AS INCLUDED IN SEWERS FOR ADOPTION 7th EDITION. THE REQUIREMENTS OF APPROVED DOCUMENT H (2002 EDITION) AND BUILDING REGULATIONS 2000.
- ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
- IT IS ADVISED THAT THE CONTRACTOR SURVEY RETAINED EXISTING DRAINAGE PRIOR TO COMMENCEMENT TO CONFIRM LOCATION AND CONDITION. POTENTIAL PRE-CLEANING TO BE UNDERTAKEN IN ORDER TO FACILITATE SURVEY IF REQUIRED.
- EXISTING SEWER LOCATIONS WHERE THE PROPOSED DRAINAGE IS TO CONNECT, ARE TO BE SURVEYED AND EXACT LEVELS CONFIRMED AND PROVIDED TO ENGINEER PRIOR TO COMMENCEMENT OF WORKS.
- ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
- ALL EXISTING DRAINS TO BE ABANDONED SHALL BE EITHER REMOVED OR GROUTED UP IF NOT POSSIBLE. GROUTING TO BE PERFORMED BY CAPPING ALL ENDS / CONNECTIONS AND FILLING THE RETAINING VOID WITH GROUT, IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION (CESWI) 7TH EDITION.
- ALL SOFT SPOTS TO BE REMOVED FROM BOTTOM OF EXCAVATIONS AND TO BE REFILLED TO FORMATION LEVEL IN ACCORDANCE WITH GROUNDWORKS SPECIFICATIONS.
- RAISED GROUND MUST BE FILLED IN ACCORDANCE WITH GROUNDWORKS SPECIFICATIONS AND CONSOLIDATED BEFORE ANY SEWER WORKS ARE CARRIED OUT.
- ALL ADAPTABLE DRAINAGE WORKS INCLUDING WORKS TO EXISTING PUBLIC SEWERS TO BE UNDERTAKEN IN ACCORDANCE WITH "SEWERS FOR ADOPTION 7th EDITION" AND "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION" AND CONSTRUCTED TO THE RELEVANT STATUTORY UNDERTAKERS DETAILS.
- ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION", BS EN 752 2008 DRAIN AND SEWER SYSTEMS OUTSIDE BUILDINGS AND THE BUILDING REGULATIONS APPROVED DOCUMENT H.
- ALL SEWERS, UNLESS AGREED OTHERWISE STATED, SHALL BE:
 - 150mm to 300mm DIA TO BE VITRIFIED CLAY.
 - 375mm DIA AND GREATER TO BE CLASS 120 CONCRETE PIPES.
- ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS.
- PIPE MATERIALS IN ACCORDANCE WITH THE FOLLOWING:
 - ALL VITRIFIED CLAY PIPES TO BS EN 295-1.
 - ALL CONCRETE PIPES TO BE TO BS EN 1916.
 - ALL CONCRETE MANHOLES TO BE TO BS EN1917.
- AS AN ALTERNATIVE THE CONTRACTOR MAY USE AN APPROVED UNPLASTICISED POLYVINYL CHLORIDE (PVCU) WITH APPROVAL FROM THE ENGINEER.
- ALL ADAPTABLE DRAINAGE PIPES WILL REQUIRE A MINIMUM OF 1200mm COVER, IN ACCORDANCE WITH SEWERAGE UNDERTAKERS REQUIREMENTS.
- ALL PRIVATE DRAINAGE PIPES WITH A COVER OF LESS THAN 600mm IN

- ALL BRANCH CONNECTIONS TO BE MADE WITH SWEEP BENDS IN THE DIRECTION OF FLOW IN THE MAIN SEWER.
- WHERE NO WC'S ARE CONNECTED UPSTREAM, UNDERSLAB FW DRAINAGE TO BE LAID AT 140 MIN. AFTER THE CONNECTION OF AT LEAST 1NO WC, A MIN. FALL OF 1:80 APPLIES.
- ALL INTERNAL COVERS TO HAVE MECHANICALLY JOINTED CORNERS AND DOUBLE SEALED WITH RECESSED TRAY TO ALLOW FOR FINISHES.
- ALL MANHOLE COVERS IN BLOCK/SLAB AND EXTERNAL PAVING AREAS TO HAVE RECESSED COVERS OF THE APPROPRIATE GRADE TO ACCEPT ARCHITECT'S PAVING PROPOSAL.
- UNLESS NOTED OTHERWISE IN THE MANHOLE SCHEDULE, ALL MANHOLE, GULLY AND CHANNEL COVERS (IRONWORK) SHOULD BE THE FOLLOWING SPECIFICATION:
 - B125 LOAD CLASS IN PEDESTRIAN AREAS
 - D400 LOAD CLASS IN VEHICULAR AREAS.
- COVER LEVELS, GULLY POSITIONS, AND BUILDING LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/LANDSCAPE ARCHITECT. CONTRACTOR TO ALLOW FOR ADJUSTMENT TO SUIT AGREED POSITIONS AND FINISHED LEVELS, AND CONFIRM ALL COVER LEVELS ON SITE.
- OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.
- THE CONTRACTOR SHALL COMPLY WITH THE FOLLOWING:-
 - (I) ALL OPERATIONS SHOULD BE CARRIED OUT IN ACCORDANCE WITH THE GENERAL HEALTH AND SAFETY POLICY OF THE DEVELOPER AS REQUIRED BY SECTIONS 2 OF THE HEALTH AND SAFETY AT WORK ACT 1974 AND IN PARTICULAR THE CONSTRUCTION (GENERAL PROVISIONS) REGULATIONS.
 - (II) THE LOCAL AUTHORITY AND UTILITIES COMPANIES ARE TO BE NOTIFIED PRIOR TO COMMENCEMENT OF WORK ON SITE.
 - (III) PRIOR TO CONSTRUCTION THE ACTUAL POSITIONS AND DEPTHS OF SERVICES LIKELY TO BE AFFECTED BY THE WORKS SHOULD BE ESTABLISHED BY MEANS OF HAND DIG IN CLOSE LIAISON WITH THE UTILITY COMPANIES. THE CONTRACTOR SHALL IMMEDIATELY ADVISE THE ENGINEER OF ANY SERVICES EXPOSED WHICH MAY AFFECT THE DESIGN.
 - (IIII) ALL OPERATIVES WORKING ON THE HIGHWAY WORKS MUST HAVE STREET WORKS ACCREDITATION.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT PIPES ARE ADEQUATELY PROTECTED FROM CONCENTRATED LOADING BY CONSTRUCTION TRAFFIC DURING THE CONSTRUCTION PERIOD.
- THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT, AND TEMPORARY AND PERMANENT DIVERSION WORKS, AS NECESSARY TO ALL EXISTING SERVICES.
- THE CONTRACTOR SHALL ALLOW FOR KEEPING TRENCHES AND EXCAVATIONS AS DRY AS PRACTICABLE BY PUMPING FROM TEMPORARY SUMPS AND DE-WATERING AS APPROPRIATE. THE POINT AND METHOD OF DISCHARGE TO BE AGREED WITH THE DRAINAGE AUTHORITY & LLFA AND ENVIRONMENT AGENCY.
- IT IS ADVISED THAT DRAINAGE WORKS ARE TO BE CONSTRUCTED FROM THE OUTFALL TOWARDS THE HEAD OF RUN TO ENSURE THE OUTFALL CAN BE ACHIEVED.
- ALL DRAINS TO BE CCTV SURVEYED ON COMPLETION OF THE WORKS.
- ALL SEWERS BEND 300mm BELOW UNDERSIDE OF STRUCTURAL SLAB UNLESS NOTED OTHERWISE.
- ALL ACCESS FITTINGS, STACKS, RWPS AND GULLIES TO BE RODDABLE. ALL TO HAVE LOW LEVEL RODDING ACCESS PLATES UNLESS AN ALTERNATIVE MEANS OF ACCESS IS AGREED. ACCESS POINT TO BE ABOVE ANY GROUND FLOOR CONNECTED APPLIANCE SPILL LEVEL.
- LARGE ACCESS FITTING REQUIRED ABOVE GROUND WHERE GREATER THAN 12M UP TO 22M TO A JUNCTION. SMALL ACCESS FITTING REQUIRED UP TO 12M TO A JUNCTION.
- ALL GULLY AND CHANNEL DRAIN OUTLETS AND TERMINATION POINTS TO BE TRAPPED AND RODDABLE. INTERNAL GULLIES AND CHANNEL DRAINS TO BE SPECIFIED BY OTHERS.

STAGE 5 DRAINAGE DESIGN BASED ON THIRD PARTY PRELIMINARY STAGE 5 INFORMATION. DESIGN SUBJECT TO CHANGE FOLLOWING RECEIPT OF FINAL / FIXED LAYOUTS.

DRAINAGE FOR EXTERNAL PAVED AREAS SHOWN INDICATIVELY AND SUBJECT TO CHANGE FOLLOWING CO-ORDINATION WITH LANDSCAPE ARCHITECT.

ALL PIPE SIZES TO BE CONFIRMED FOLLOWING RECEIPT OF FINAL M&E INFORMATION.

M&E ENGINEER TO CONFIRM ALL UNDERSLUNG DRAINAGE INVERT LEVELS WHERE PASSING THROUGH WALL.

RELIC PILES TO BE CUT OFF 300mm BELOW PROPOSED DRAINAGE INVERT LEVELS AT INDIVIDUAL LOCATIONS.

INVERT LEVELS OF POP UPS ARE 600mm BELOW SLAB LEVEL UNLESS NOTED OTHERWISE.

INVERT LEVELS OF FLOOR GULLIES ARE ASSUMED 450mm BELOW SLAB LEVEL. SUBJECT TO CHANGE FOLLOWING SPECIFICATION OF GULLY UNIT BY OTHERS.

ALL SURFACE WATER DRAINAGE IS 150mm DIA UNLESS STATED OTHERWISE

ALL FOUL DRAINAGE IS 100mm DIA UNLESS STATED OTHERWISE.

ALL ABOVE GROUND ACCESS FITTINGS REQUIRE 24 HOUR ACCESS.

ACCESS PANELS ARE TO BE PROVIDED WHERE PIPEWORK IS BOXED IN.

PROPOSED SURFACE WATER MANHOLE SCHEDULE - REFER TO SFA 7th EDITION									
MH	CL	IL	DEPTH TO SOFFIT (m)	DS PIPE DIA (mm)	MH DIA (mm)	MH TYPE	COVER TYPE	EASTING (X)	NORTHING (Y)
S1	34.738	32.870	1.643	225	1200	TYPE 2	600 x 600 - D400	384308.452	397357.319
S2	34.738	32.840	1.673	225	1200	TYPE 2	600 x 600 - D400	384305.846	397362.251
S3	34.150	32.291	1.634	225	1200	TYPE 2	600 x 600 - D400	384293.129	397387.271
S4	33.880	32.031	1.624	225	1200	TYPE 2	600 x 600 - D400	384288.701	397395.602
S5	33.538	31.583	1.580	375	1800	TYPE 2	600 x 600 - D400	384283.454	397406.038
S6	33.500	31.273	1.852	375	1500	TYPE 2	600 x 600 - D400	384279.107	397413.932
S7	33.500	30.860	2.265	375	1500	TYPE 2	600 x 600 - D400	384273.101	397423.264
S8	33.600	32.426	1.024	150	1200	TYPE 2	600 x 600 - D400	384272.044	397434.142
S9	33.525	30.654	2.496	375	1500	TYPE 2	600 x 600 - D400	384268.217	397428.291
RE 1a	34.800	33.620	1.030	150	150	RE	D400	384325.409	397379.197
PPIC S1A	34.800	33.050	1.525	225	600	PPIC	450 x 450 - D400	384332.531	397365.799
PPIC S2A	34.800	32.910	1.665	225	600	PPIC	450 x 450 - D400	384313.616	397355.744
CHAMBER OMITTED									
PPIC S2C	34.800	33.168	1.482	150	450	PPIC	450 x 450 - D400	384307.883	397366.550
PPIC S2D	34.800	32.945	1.705	150	450	PPIC	450 x 450 - D400	384309.206	397364.040
PPIC S3A	34.410	33.000	1.260	150	450	PPIC	450 x 450 - D400	384299.429	397382.425
PPIC S3B	34.310	32.907	1.253	150	450	PPIC	450 x 450 - D400	384297.956	397385.190
PPIC S3C	33.900	33.000	0.750	150	450	PPIC	450 x 450 - D400	384313.289	397398.308
PPIC S3D	34.050	32.525	1.375	150	450	PPIC	450 x 450 - D400	384306.845	397394.858
PPIC S3E	34.159	32.410	1.599	150	450	PPIC	450 x 450 - D400	384296.475	397389.369
PPIC S5A	33.640	32.876	0.614	150	450	PPIC	450 x 450 - D400	384287.033	397407.202
PPIC S7A	33.590	32.710	0.730	150	450	PPIC	450 x 450 - D400	384279.865	397421.256
PPIC S7B	33.570	32.648	0.772	150	450	PPIC	450 x 450 - D400	384275.837	397425.207
RE 8a	33.600	32.830	0.620	150	150	RE	D400	384299.600	397426.750
PPIC S8A	33.425	32.635	0.640	150	450	PPIC	450 x 450 - D400	384290.464	397443.936

PROPOSED FOUL WATER MANHOLE SCHEDULE - REFER TO SFA 7th EDITION									
MH	CL	IL	DEPTH TO SOFFIT (m)	DS PIPE DIA (mm)	MH DIA (mm)	MH TYPE	COVER TYPE	EASTING (X)	NORTHING (Y)
F1	34.760	33.025	1.510	225	1200	TYPE 2	600 x 600 - D400	384309.791	397361.234
F2	34.200	31.970	2.005	225	1200	TYPE 2	600 x 600 - D400	384295.678	397387.785
F3	33.910	29.569	4.116	225	1200	TYPE 1B	600 x 600 - D400	384286.533	397404.956
F4	33.570	29.247	4.098	225	1200	TYPE 1B	600 x 600 - D400	384276.780	397423.269
F17	33.538	28.854	4.384	300	1500	TYPE 1B	600 x 600 - D400	384268.294	397431.810
F17A	33.570	31.950	1.520	100	450	PPIC	450 x 450 - D400	384272.842	397431.831
CHAMBER OMITTED									
F1A	CHAMBER OMITTED								
F2A	33.950	32.705	1.145	100	450	PPIC	450 x 450 - B125	384304.900	397416.753
F2B	33.910	32.443	1.367	100	450	PPIC	450 x 450 - D400	384314.875	397397.990
F2C	34.000	32.368	1.532	100	450	PPIC	450 x 450 - D400	384309.160	397394.952
F2D	34.050	32.330	1.620	100	450	PPIC	450 x 450 - D400	384306.098	397393.324
F2E	34.083	32.292	1.641	150	450	PPIC	450 x 450 - D400	384304.058	397392.240
F2F	34.800	32.249	2.451	100	450	PPIC	450 x 450 - D400	384308.552	397366.715
F2G	34.467	32.860	1.507	100	450	PPIC	450 x 450 - B125	384318.13	397377.783
F2H	34.467	32.734	1.583	150	450	PPIC	450 x 450 - B125	384314.686	397375.951
F2I	34.450	32.529	1.771	150	450	PPIC	450 x 450 - D400	384305.092	397373.242
F2J	34.450	32.351	1.949	150	450	PPIC	450 x 450 - D400	384299.805	397383.203
F2K	34.200	32.175	1.875	150	900	Type 1B	450 x 450 - D400	384296.974	397388.474
F2L	34.800	33.735	0.915	150	450	PPIC	450 x 450 - D400	384317.913	397370.601
F3A	33.945	32.200	1.645	100	450	PPIC	450 x 450 - D400	384290.067	397401.467
F3B	33.945	32.150	1.695	100	450	PPIC	450 x 450 - D400	384289.489	397402.476
CHAMBER OMITTED									
F3C	CHAMBER OMITTED								
F3D	30.600	29.990	0.510	100	450	PPIC	450 x 450 - B125	384292.766	397420.523
F3E	30.600	29.907	0.593	100	450	PPIC	450 x 450 - B125	384288.363	397417.877
F3F	30.600	29.764	0.736	100	750 X 600	Type 3	450 x 450 - B125	384292.717	397408.508
F4A	33.600	32.550	0.900	150	450	PPIC	450 x 450 - D400	384284.275	397411.708
F4B	33.580	32.405	1.025	150	450	PPIC	450 x 450 - D400	384280.252	397419.39
CHAMBER OMITTED									
F4C	CHAMBER OMITTED								
F17A	33.590	32.040	1.450	100	450	PPIC	450 x 450 - D400	384274.371	397431.893

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Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer
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Status: STAGE 5 ISSUE

Project: FORMER BBC SITE
OXFORD ROAD, MANCHESTER

Orig Title: BUILDINGS 7 & 8
PROPOSED DRAINAGE LAYOUT

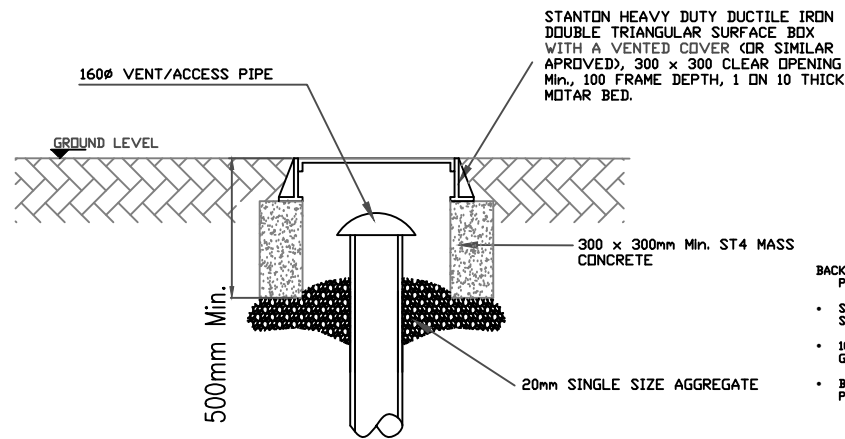
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CSAL	CUR	ZL	ZZ	DR	C	90001	-C09

Building 78, Circle Square

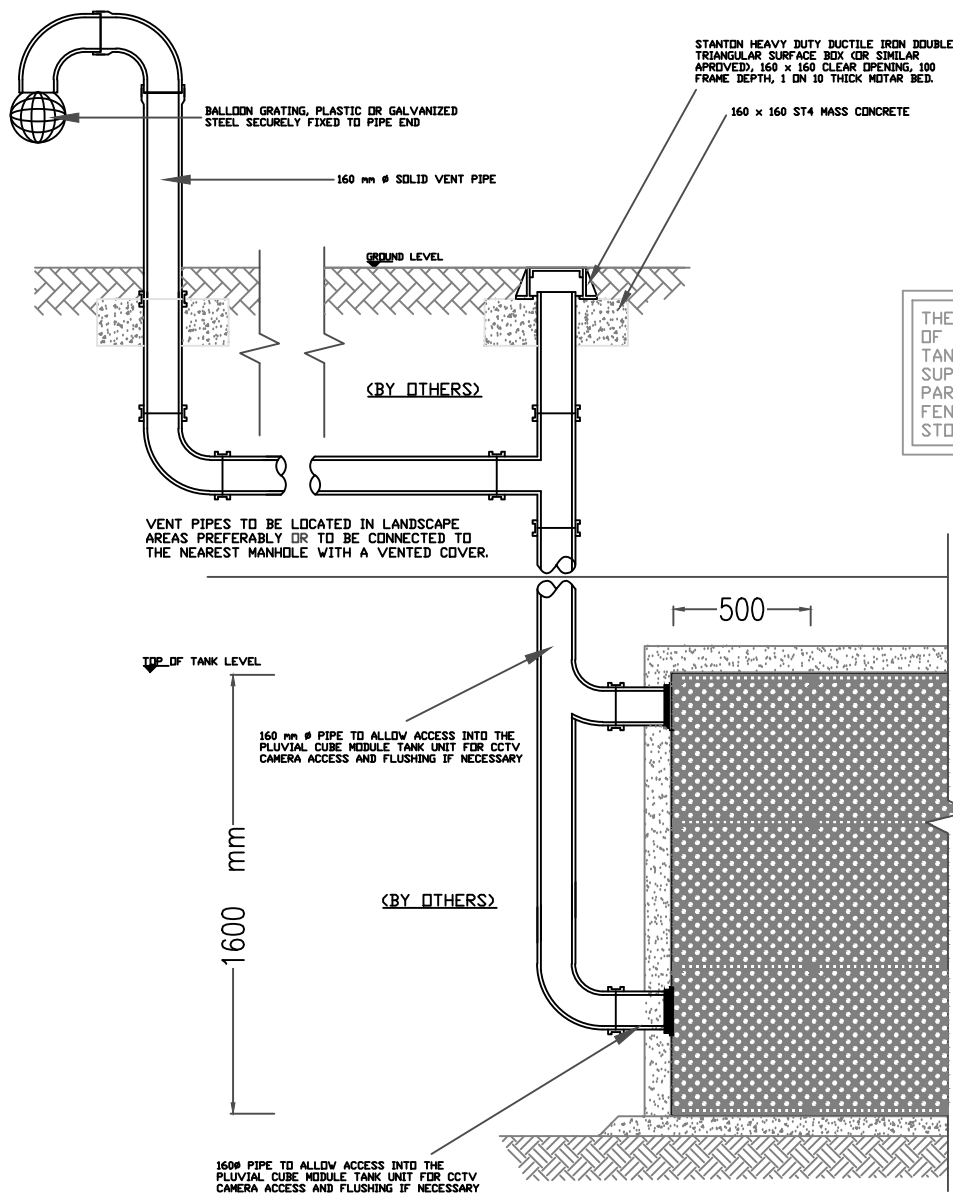
Implementation, Maintenance and Management of the SuDS

Appendix B

Manufacturers Details (SuDS)

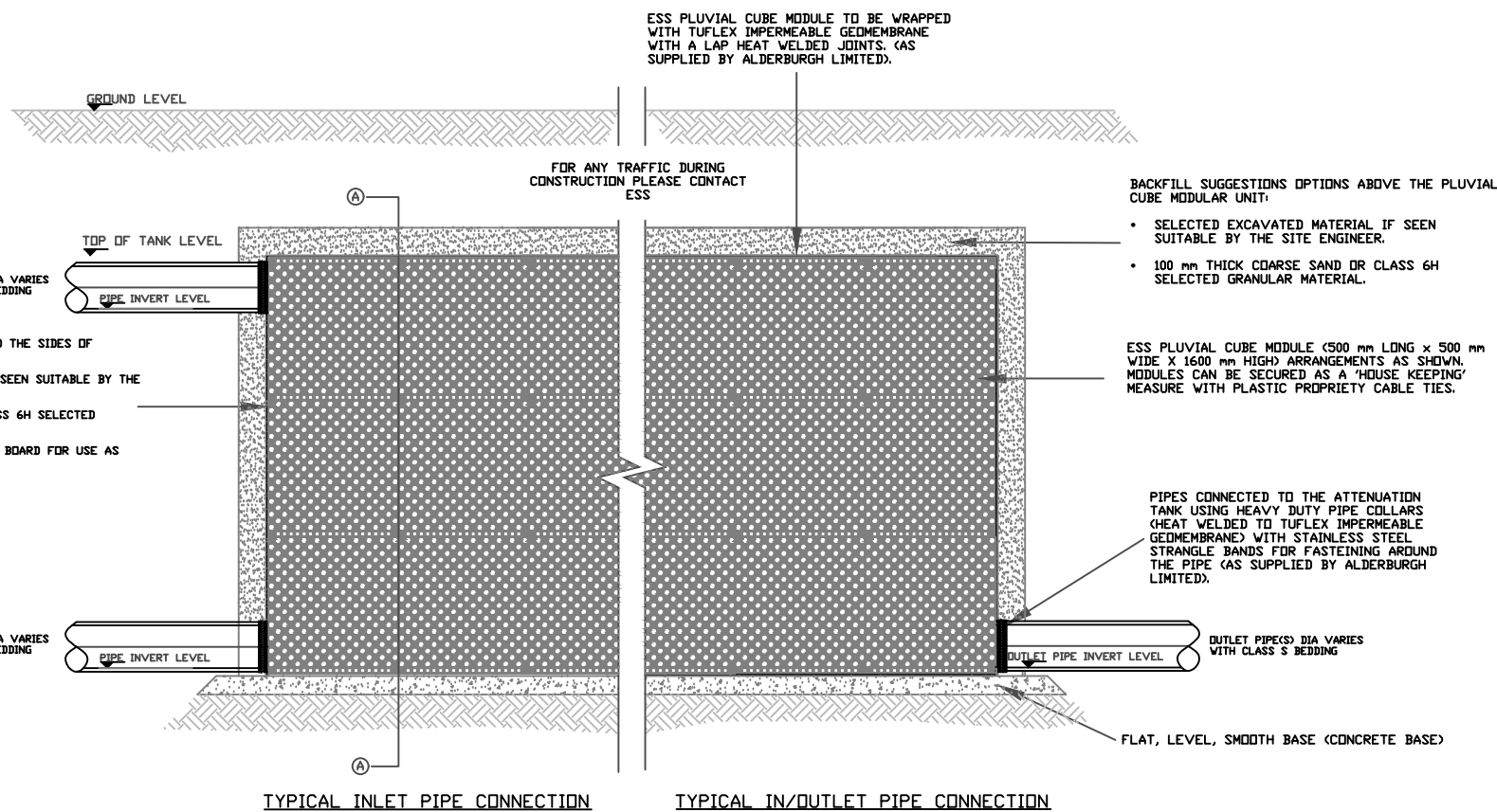


VENT BOX DETAIL
BY OTHERS
(OPTIONAL)



TYPICAL 160mm VENT/ACCESS PIPE CONNECTION

- BACKFILL SUGGESTIONS OPTIONS AROUND THE SIDES OF PLUVIAL CUBE MODULAR UNIT:
- SELECTED EXCAVATED MATERIAL IF SEEN SUITABLE BY THE SITE ENGINEER.
 - 100 mm THICK COARSE SAND OR CLASS 6H SELECTED GRANULAR MATERIAL.
 - BACKERBOARD HD (IS A PREMOULDED BOARD FOR USE AS PROTECTION AGAINST BACKFILL)

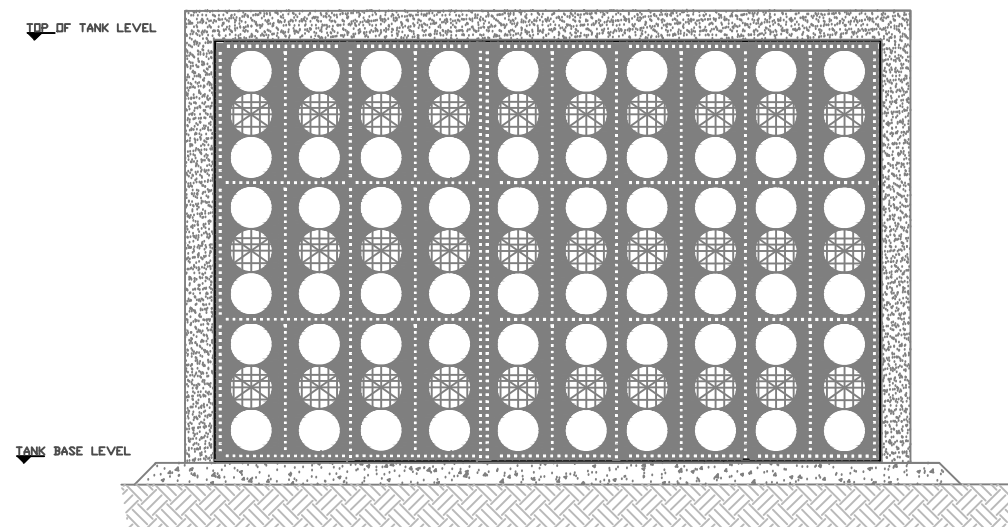


TYPICAL DETAILS OF ATTENUATION TANK USING
PLUVIAL CUBE MODULAR UNITS

INLET/OUTLET PIPES MUST BE SUPPORTED WITH CONCRETE TO PROTECT IT DURING BACKFILLING

THE CONTRACTOR SHALL PROHIBIT THE MOVEMENT OF CONSTRUCTION PLANT ACROSS THE STORAGE TANK AND WHERE NECESSARY PROVIDE ADDITIONAL SUPPORT AND PROTECTION TO THE STRUCTURE. PARTICULARLY POST CONSTRUCTION. TEMPORARY FENCING CAN BE USED TO PROHIBIT TRADE STOCKS, PILLING MATERIALS, HEAVY PLANTS ETC.,

A 3 - 5% CBR HAS BEEN ASSUMED AT SUB-BASE LEVEL SHOULD THE CBR BE TESTED AND FOUND TO BE LESS THAN 3% THEN THE ENGINEER SHALL BE NOTIFIED. ALSO, ANY SOFT SPOTS FOUND AT SUB-BASE LEVEL SHALL BE REPORTED TO THE ENGINEER



TYPICAL DETAILS OF ATTENUATION TANK USING
PLUVIAL CUBE MODULAR UNITS

(SECTION A-A)

Notes :-

1. ALL STORAGE TANK DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS, METHOD STATEMENTS AND RECOMMENDATIONS OF ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED, ROCHDALE.
2. THE LOCATION, SIZE AND DEPTH OF ALL EXISTING DRAINS / SEWERS AND SERVICES SHALL BE ESTABLISHED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORKS ON SITE. ANY DISCREPANCIES FROM THE INFORMATION INDICATED IN THESE DRAWINGS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
3. THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT AND DIVERSION WORKS AS NECESSARY, TO ALL EXISTING SERVICES TO THE SATISFACTION OF THE PUBLIC UTILITIES.
4. THE CONTRACTOR SHALL ALLOW FOR DEALING WITH SURFACE WATER RUN-OFF INTO EXCAVATIONS AND FROM GROUNDWATER BY MEANS OF SUMPS, PUMPING AND DE-WATERING AS APPROPRIATE. IN ORDER TO KEEP THE EXCAVATION AS REASONABLY DRY AS POSSIBLE DURING THE CONSTRUCTION OF THE WORKS.
5. ALL LEVELS AND DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS. ANY DISCREPANCIES SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
6. THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY PRECAUTIONS IN LINE WITH CURRENT LEGISLATION WHEN WORKING IN / NEAR CONFINED SPACES, DEEP EXCAVATIONS AND MACHINERY.
7. THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY TO PROTECT PEDESTRIANS AND VEHICLES FROM THE WORKING AREAS.
8. TO PROTECT THE ESS PLUVIAL CUBE MODULAR ATTENUATION / STORAGE TANK FROM CONSTRUCTION SITE DEBRIS, THE CONTRACTOR SHALL ENSURE THAT STOPPERS ARE SECURELY PLACED IN ALL CONNECTIONS IMMEDIATELY UPSTREAM OF THE TANK UNITS, ONLY TO BE REMOVED ONCE THE FINAL CLEANING OF THE ROADS / DRAINAGE HAS BEEN COMPLETED.
9. UPON COMPLETION OF THE WORKS THE CONTRACTOR SHALL CLEAN ALL DRAINAGE BY JETTING, REMOVING ALL DEBRIS FROM SITE, NO DEBRIS SHALL BE PERMITTED TO ENTER THE TANK STORAGE SYSTEM.
10. NUMBER OF VENT UNITS DEPENDS ON THE SIZE OF THE TANK (REFER LAYOUT DRAWING)
11. REFER SEQUENCE OF WORK DOCUMENT FOR DETAILED INSTALLATION METHODOLOGY (CONTACT ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED)

Notes :- All the Dimensions by Millimeters



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PROJECT

CIRCLE SQUARE, AFFINITY LIVING
BLOCKS 5-8

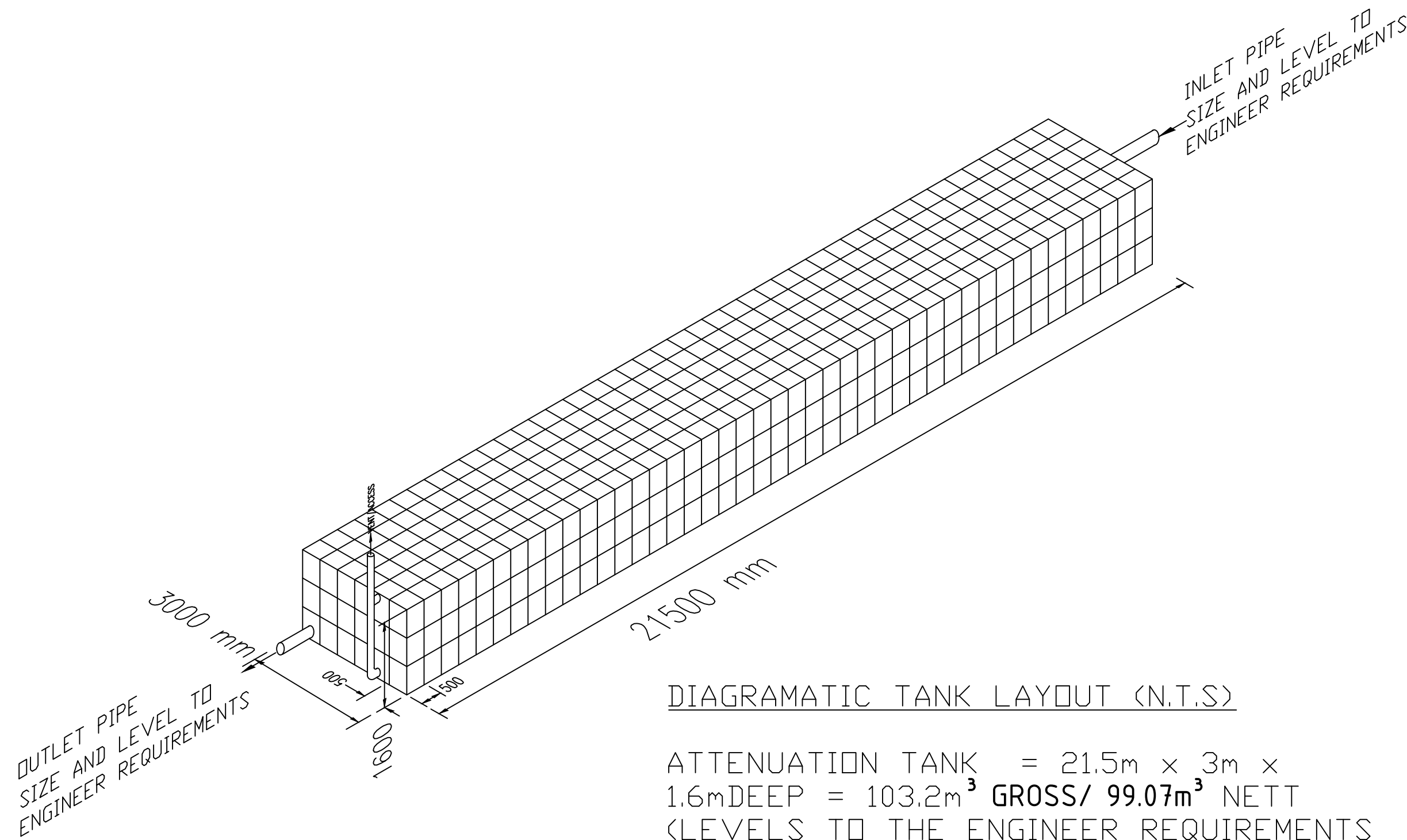
ATTENUATION TANK - DETAILS

TITLE

ATTENUATION STORAGE TANK DETAILS
USING PLUVIAL CUBE MODULAR UNITS.

Scale	Drawn	Checked
NTS	VH	PD
Date	Drawing No.	Revision
01/05/2018	PCST - 3.0	R0

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DIAGRAMATIC TANK LAYOUT (N.T.S)

ATTENUATION TANK = 21.5m x 3m x 1.6m DEEP = 103.2m³ GROSS/ 99.07m³ NETT
(LEVELS TO THE ENGINEER REQUIREMENTS PLEASE REFER TO THE LATEST DRAINAGE LAYOUT)

- Notes :-
1. ALL STORAGE TANK DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS, METHOD STATEMENTS AND RECOMMENDATIONS OF ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED, ROCHDALE.
 2. THE LOCATION, SIZE AND DEPTH OF ALL EXISTING DRAINS / SEWERS AND SERVICES SHALL BE ESTABLISHED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORKS ON SITE. ANY DISCREPANCIES FROM THE INFORMATION INDICATED ON THESE DRAWINGS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
 3. THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT AND DIVERSION WORKS AS NECESSARY, TO ALL EXISTING SERVICES TO THE SATISFACTION OF THE PUBLIC UTILITIES.
 4. THE CONTRACTOR SHALL ALLOW FOR DEALING WITH SURFACE WATER RUN-OFF INTO EXCAVATIONS AND FROM GROUNDWATER BY MEANS OF SUMPS, PUMPING AND DE-WATERING AS APPROPRIATE. IN ORDER TO KEEP THE EXCAVATION AS REASONABLY DRY AS POSSIBLE DURING THE CONSTRUCTION OF THE WORKS.
 5. ALL LEVELS AND DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS. ANY DISCREPANCIES SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
 6. THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY PRECAUTIONS IN LINE WITH CURRENT LEGISLATION WHEN WORKING IN / NEAR CONFINED SPACES, DEEP EXCAVATIONS AND MACHINERY.
 7. THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY TO PROTECT PEDESTRIANS AND VEHICLES FROM THE WORKING AREAS.
 8. TO PROTECT THE ESS PLUVIAL CUBE MODULAR ATTENUATION / STORAGE TANK FROM CONSTRUCTION SITE DEBRIS, THE CONTRACTOR SHALL ENSURE THAT STOPPERS ARE SECURELY PLACED IN ALL CONNECTIONS IMMEDIATELY UPSTREAM OF THE TANK UNITS, ONLY TO BE REMOVED ONCE THE FINAL CLEANING OF THE ROADS / DRAINAGE HAS BEEN COMPLETED.
 9. UPON COMPLETION OF THE WORKS THE CONTRACTOR SHALL CLEAN ALL DRAINAGE BY JETTING, REMOVING ALL DEBRIS FROM SITE, NO DEBRIS SHALL BE PERMITTED TO ENTER THE TANK STORAGE SYSTEM.
 10. NUMBER OF VENT UNITS DEPENDS ON THE SIZE OF THE TANK (REFER LAYOUT DRAWING)
 11. REFER SEQUENCE OF WORK DOCUMENT FOR DETAILED INSTALLATION METHODOLOGY (CONTACT ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED)

Notes :- All the Dimensions by Millimeters



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PROJECT
CIRCLE SQUARE, AFFINITY LIVING
BLOCKS 5-8
ATTENUATION TANK - LAYOUT

TITLE
ATTENUATION STORAGE TANK DETAILS
USING PLUVIAL CUBE MODULE UNITS.

Scale NTS	Drawn VH	Checked PD
Date 01/05/2018	Drawing No. PCST - 3.1	Revision R0

PLUVIAL CUBE MODULE – DATA SHEET

Pluvial Cube Module Dimensions* (mm)	Module Configuration	Units per m ³	Module Volume (m ³)	Storage Volume (m ³)
500 (L) x 500 (W) x 550 (D)	Single	7.27	0.1375	0.132
500 (L) x 500 (W) x 1075 (D)	Double	3.72	0.2688	0.258
500 (L) x 500 (W) x 1600 (D)	Triple	2.5	0.4	0.384

* Bespoke modules with different configuration available



Single Module



Double Module



Triple Module

Product Data	Standard Pluvial Cube Module	Heavy Duty Pluvial Cube Module
Application	Stormwater Management	Stormwater Management
Average Weight (kg) – single module	7	8
Compressive Strength* (kN/m ²)	320	400
Lateral Strength* (kN/m ²)	200	200
Long Term Creep Testing** (kN/m ²)	90	120
Void Ratio (%)	96	96
Surface Void Ratio (%)	Greater than 90	Greater than 90
Minimum Backfill Cover [#] (mm)	450	450
Maximum Backfill Cover (mm)	4500	5000
Material	Polypropylene	Polypropylene
Chemical resistance	Good	Good
Bacterial Resistance	Good	Good
UV Resistance	Good	Good

Note: Other Modules with Compressive Strength more than 1500 kN/m² available

* Modules tested using UKAS calibrated test machine, range 0 – 60 Tons, UDL, loading rate 0.2 kN/m²

** Modules tested for long term creep testing for 90, 180 days and new ongoing test for 208 days.

[#] Any cover less than 450 mm – contact ESS design department

Note: All Alderburgh products are manufactured to the highest quality, being subjected to rigid quality control. However the company cannot control conditions of application and use of its products, thus any warranty, written or implied, is given in good faith for materials only. Alderburgh Ltd will not accept any responsibility for damage or injury arising from storage handling, misapplication or misuse of its products. All transactions are subject to our standard condition of sales, copies of which are available on request. Product design and specification are subject to change without further notice

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GEOTEX 300 PP

DESCRIPTION

A needle punched non woven geotextile made from 100% virgin polypropylene staple fibres, UV resistant, produced without the addition of chemical binders and without thermal bonding of the filaments.

PRIMARY FUNCTIONS

Fabric used for ground stabilisation and membrane protection.
Enclosing granular layers in formed drainage systems.

TECHNICAL DATA

Roll Size:	Width	6 m	
	Length	50m, 100m	
Weight:	300g/m ²		
Fabric Thickness:	4.0mm nom.		BS 2544 AS
Tensile strength:	MD	13KN/M	BSEN ISO 10319
	CD	21KN/M	BSEN ISO 1996
Extension:	MD	103%	BSEN ISO 1996
	CD	80%	BSEN ISO 1996
Water Transmittivity	@ 100mm head	140 lt/m/sec	BSEN ISO 10319
Apparent Opening size	90% finer	90 microns	BS6906 PE2 1989
CBR (Puncture):	Part 4	2400N	
Displacement (mm)		70	
Cone PropTest (mm)		17mm	

The above are typical mean values of 5 samples taken at random for test purposes, as defined in BSEN ISO standard.

SPECIFICATION

The Geotex 300PP filter fabric should be specified by name with specific reference to the technical requirements of its use

GEOMEMBRANES

ALDERPRUFE TUFLEX



Features

Excellent Barrier Properties

High Puncture Resistance

**Exceptional Multiaxial Stress
and Strain Properties**

Good Tear Resistance

High Surface Friction

**Good Low Temperature
Behaviour**

**Low Coefficient of Thermal
Expansion**

Very Good Chemical Resistance

Very Good UV Resistance

**Excellent Environmental Stress
Crack Resistance (ESCR)**

**Excellent Welding Properties -
Wide Seaming Temperature
Window**

General Description

Alderprufe Tuflex is a single layer cold applied geomembrane suitable for environmental protection to structures, containments and cut-off trenches.

Alderprufe Tuflex combines excellent chemical resistance with low flexural modulus to provide a malleable, flexible membrane suitable for non-smooth surfaces and factory prefabrication to optimise on-site installation.

Alderprufe Tuflex is the ideal membrane for building protection systems and cut-off trench containment particularly on contaminated sites which would otherwise prove too difficult or costly to develop.

Building Protection Membrane

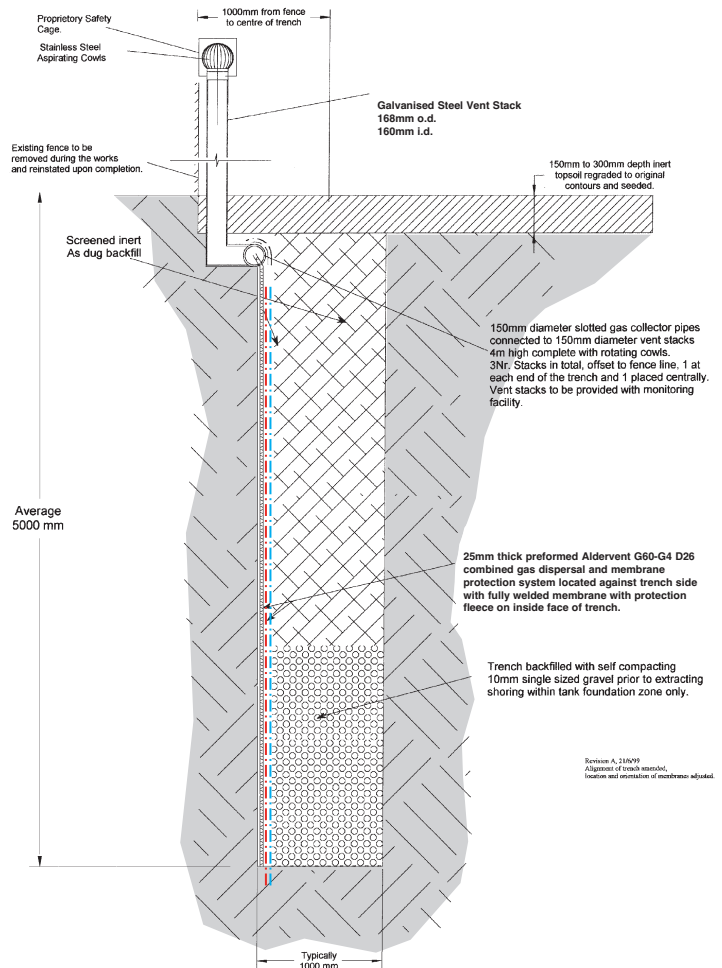
Applied as a Gas Barrier Membrane to protect the building against the ingress of all land borne gases - Methane, Carbon Dioxide and Radon. Tuflex is laid in a single layer over a prepared site. Due to its inherent weldability and on site quality assurance monitoring, the membrane is recommended to be laid by trained operatives certified for the purpose. On smaller sites factory fabricated panels can be supplied for application by others. Applied to cover the whole of the slab area above Aldervent gas ventilation system if required.

All membrane penetrations (i.e. steel stanchions and service entry points) to be sealed with factory formed units welded to the membrane on site.

At all points where the membrane passes through load bearing walls, Aldercourse Tuflex DPC or GRA DPC is installed and welded to the overlying Tuflex membrane.



Pressure testing of welded joints
(part of standard CQA procedures)



Membrane Protection

Protect finished membrane with Geotex or Alderway protection mats if following trades are erecting steel fabrication for slab reinforcement.

All punctures to be repaired by a minimum overlap of 150mm.

Cut-off Trench Containment

Alderprufe Tuflex has been successfully installed up to 8 metres deep as a vertical barrier to contain contaminants and gases on brown fields sites and around landfill.

Installed by accredited contractors.

Bespoke systems have been designed to suit site specific parameters.

Trilaminate membranes with exceptionally high puncture resistance are available.

Cut-off trenches for contaminant control, with large volume gas and liquid dispersal properties, are possible, utilising Aldervent Geogrid, Geovoid, or Geocell systems. (see separate data sheets.)



This product satisfies the criteria set out in BS 6920: Part 1: 1996 "Specification" and thus complies with the requirements of the Water Bylaws Scheme Tests of Effect on Water Quality (BS 6920: 1996). It is suitable for use with cold but not hot water.

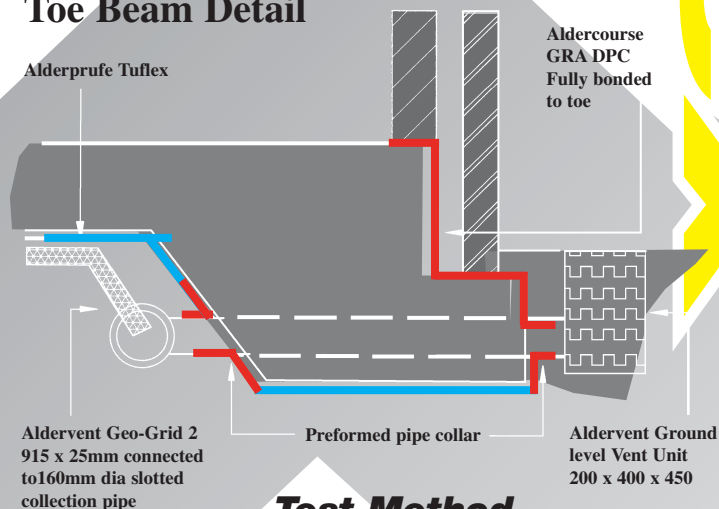
In-service performance

The demands made on Alderprufe Tuflex in landfill, water containment or pollution control are considerable. The flexibility of Alderprufe Tuflex is due to the polymeric structure of the resin. There are no plasticisers in the Alderprufe Tuflex formulation that can be leached out by exposure to chemicals or sunlight causing the membrane to become brittle.

Design and Specification

All Alderprufe Tuflex systems carry Product Guarantee Insurance including efficacy cover. Bespoke system designs with third party accreditation including P.I. cover are available to the developer to offer full security and warranties.

Toe Beam Detail



Test Method

Thickness mm +/- 10%	0.75	1.0	1.5	ASTM D - 751
Density g/cm ³	0.9	0.9	0.9	ASTM D - 792
Tensile Stress @ break Min N/mm ²	13	18	26	ASTM D - 638
Elongation @ Break %	>700	>700	>750	ASTM D - 638
Puncture Resistance Min N	120	150	200	FTMS 101C Method 2065
Tear Resistance Min N	45	60	90	ASTM D - 1004
Dimensional Stability	+/-2%	+/- 2.0	+/-2%	ASTM D - 1204
% Change Max				1 Hr @ 1000C
Stress Crack Resistance	100%	100%	100%	ASTM 5397
Volatile Loss 5%	0.2	0.2	0.2	ASTM D - 1203
Loss Max				Method A
Ozone Resistance	No cracks	No Cracks	No Cracks	ASTM D - 1149
Carbon Black Content	2-3%	2 - 3%	2-3%	ASTM 1063
Moisture Vapour g/m ² /day	<0.01	< 0.1	<0.01	ASTM E96
Friction Angle (Non Woven Geotextile)		21°		Shear Box
Methane Permeability	0.14	0.11	0.007	European standard g/m ² /day/atm
Methane Transmission Rate		1.8 x 10 ⁻⁹ m ³ /m ² /s/atm		BRE
Permeability Coefficient		1,8 x 10 ⁻¹²		



Alderprufe Tuflex possess exceptional flexibility, tear and puncture resistance qualities for all water containment projects, even at very low temperatures.

Ornamental ponds and water storage lakes used in landscaping and irrigation projects utilise the special attributes of the Alderprufe Tuflex geomembrane.



Alderprufe Tuflex geomembranes are used as liners and capping to contain both the gas and liquids produced by a landfill operation. The multiaxial strain qualities of Alderprufe Tuflex are so good that the geomembrane will resist out of plane forces caused by subsidence which occurs with differential waste consolidation and unstable site substrates





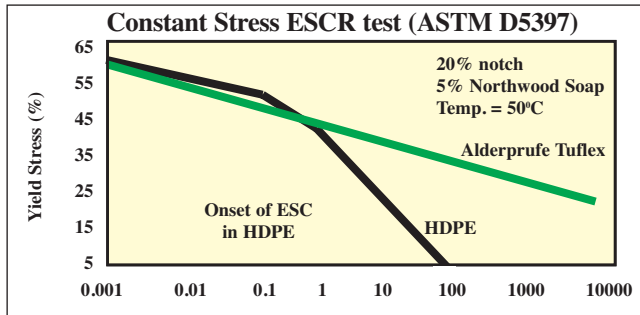
The flexibility of Alderprufe Tuflex geomembranes ensures that most ponds, ditches, lagoons, lakes and dams can be lined including those with inherently complex shapes.



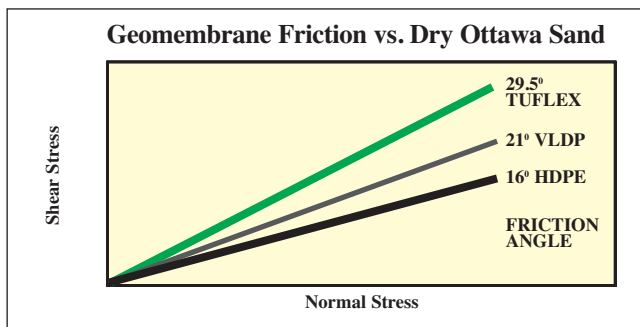
The exceptionally wide seaming temperature window ensures a reliable weld is achieved in most weather conditions. Fluctuations in temperature are not as critical as they are with other geomembranes.

Tuflex

Environmental Stress Crack Resistance (NCTL)



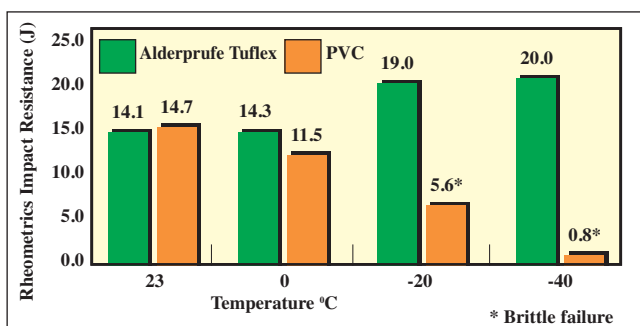
Comparative Friction Angles



Alderprufe Tuflex possesses outstanding environmental stress crack resistance compared to other materials. Alderprufe Tuflex also retains its flexibility at low temperatures and does not become brittle even at temperatures as low as -40°C. This feature is particularly important as it enables the Geomembrane to be handled or installed during severe weather conditions or at high altitude.

The friction angle of Alderprufe Tuflex measured by this method is higher than that of all the commonly used smooth geomembrane materials. This allows the construction of steeper side slopes, increasing the capacity and, in the case of landfills, speeding up waste settlement.

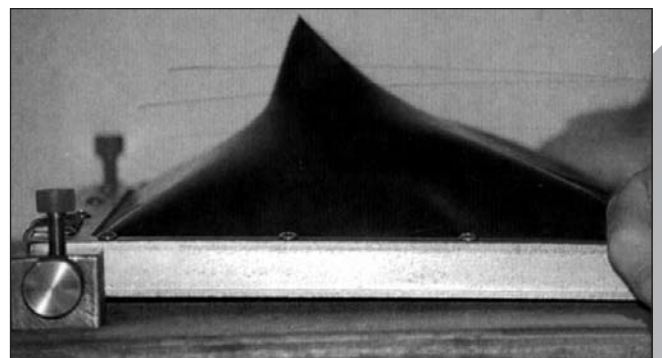
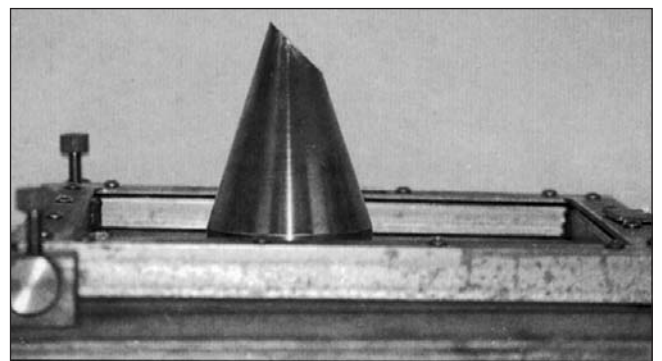
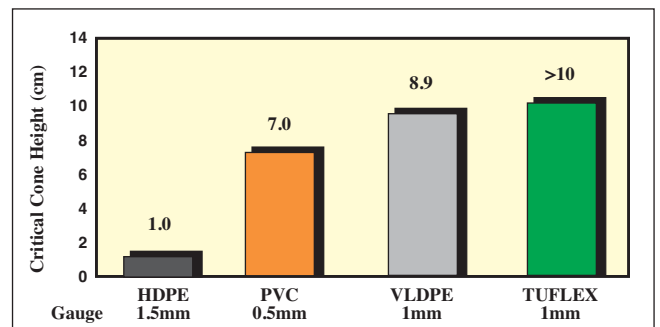
Low Temperature Impact Resistance



Puncture Resistance Truncated Cone

Alderprufe Tuflex, when placed under load on uneven or rocky substrates, has an exceptionally high puncture resistance. It even exceeds the specifications of GRI test method GM - 3 and possesses the highest puncture resistance of all geomembrane materials measured by this test.

Alderprufe Tuflex readily conforms to projections and deforms easily when under static load. Stresses are evenly distributed throughout the material's structure as it deforms thus allowing the membrane to maintain its "barrier" properties when subjected to both short and long term static loads.



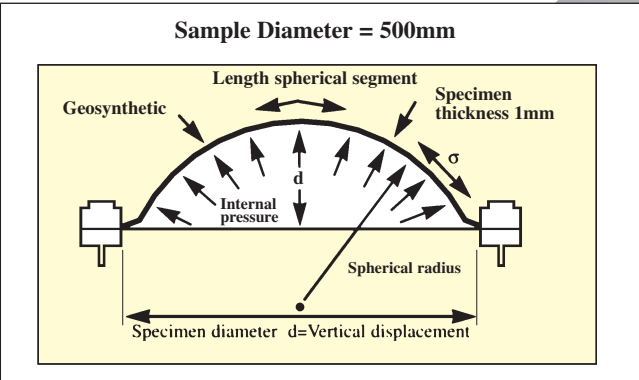
Large Scale Multiaxial Stress-Strain Test



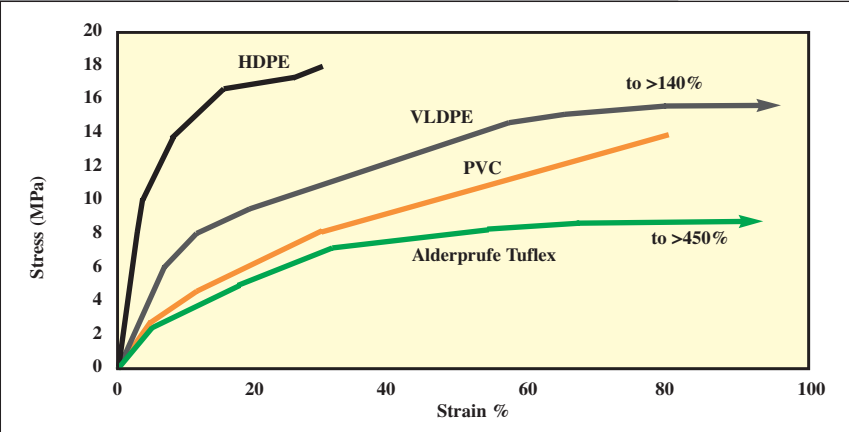
One of the most noteworthy features of Alderprufe Tuflex is the inherent ability to elongate when subjected to out of plane stresses. Localised deformation typically occurs in a landfill capping as the solid waste subsides or under slabs as piled sites are subject to ground subsidence.

The outstanding multiaxial performance of Alderprufe Tuflex is most beneficial in these applications where a high degree of subsidence is anticipated.

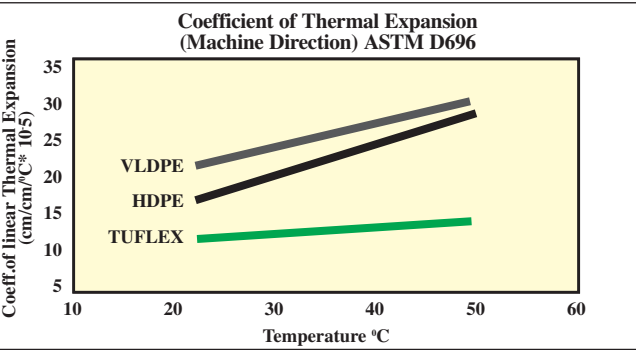
the excellent multiaxial elongation demonstrated by Alderprufe Tuflex indicates that it can accommodate more differential settlement than other membranes.



Geomembrane Multiaxial Stress-Strain Behaviour

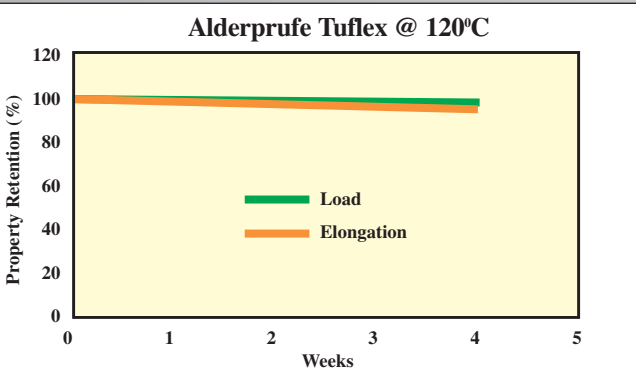


Coefficient of Thermal Expansion



Alderprufe Tuflex has an unusually low coefficient of thermal expansion (CLTE), as little as half that of some other geomembranes. During installation, Alderprufe Tuflex geomembrane does not expand or contract as much and therefore forms fewer and smaller wrinkles. Also, placement of cover material may be simplified since the liner has a better tendency to lay flat. These factors lead to easier and higher quality installations.

Thermal Ageing tests of Alderprufe Tuflex Geomembranes



The high melting point of Alderprufe Tuflex makes it particularly suitable for environments such as black liquor effluent ponds with operating temperatures of 70°C and solar ponds where liners must withstand temperatures fluctuating from 10° - 80°C. Alderprufe tuflex maintains its mechanical properties across an unusually broad range of temperatures.

TUFLEX-P CHEMICAL RESISTANCE

The following chemical resistance values are provided only as a guide

Chemical	Concentration	Temperature °C	Resistant
A			
Acetic acid	100%	50	S
Acetic anhydride	100%	50	S
Acetone	100%	50	S
Acrylonitrile	100%	50	S
Aluminium hydroxide		23	S
Aluminium sulphate	38%	23	S
Ammonia water (conc)	100%	30	S
Ammonium chloride	30%	50	S
Ammonium hydroxide	100%	23	S
Ammonium nitrate	50%	50	S
Ammonium phosphate(monobasic)	20%	50	S
Ammonium phosphate (di-basic)	24%	30	S
Ammonium sulphate	43%	30	S
Amyl acetate	100%	30	U
Amyl alcohol		30	S
Aniline		30	S
B			
Barium Chloride	27%	30	S
Barium Hydroxide	20%	30	S
Barium Sulphate	sat	30	S
Benzene		23	U
Benzyl alcohol			S
Boric acid	5%	30	S
N-butanol	100%	30	U
Butyraldehyde			
C			
Calcium carbonate	sat	50	S
Calcium chloride	50%	30	S
Calcium hydroxide	100%	23	S
Chloroacetic	25%	30	S
Chloroform	100%	23	U
Chlorosulphonic acid	98%	30	U
Chromic acid	50%	30	U
Citric acid	33%	30	S
Cresol (Meta)			U
Cupric chloride	sat	30	S
Cupric sulphate	sat	50	S
Cychlorohexane	100%	30	U
Cyclohexanol			
D			
Decalin		30	U
Di-butyl phthalate		30	S
Di-ethyl ether			U
Di-octyl phthalate		30	S
Dimethylamine	40%	23	S
E			
Ethanediol	40%	23	S

Chemical	Concentration	Temperature °C	Resistant
Ethanol	100%	23	S
Ethyl acetate	50%	23	S
Ethyl alcohol (denatured)		30	S
Ethylene glycol	100%	23	S
F			
Ferric chloride	15%	30	S
Ferric sulphate	17%	30	S
Formaldehyde	37%	23	S
Formic acid	99%		U
Furfural		30	S
G			
Gasoline	35%	23	U
Glycerine		30	S
H			
Hexane	100%	23	U
Hydrochloric acid		30	S
Hydrofluoric acid	40%	30	S
I			
Indolene			U
Iso-butyaldehyde			
Isoctane			U
Isopropanol	30%	23	U
Iso-propyl ether			U
K			
Kerosene	100%		U
L			
Lactic acid	pure	50	S
Linseed oil			U
M			
Magnesium chloride	sat	30	S
Methanol	50%	23	S
Methylene chloride	100%	23	U
Methyl acetate			U
Methyl alcohol			S
Methyl ethyl ketone			U
Methylisobutylketone	60%	23	S
Methyl methacrylate			U
N-methylmorpholine oxide	60%	23	S
N			
Nickel chloride	33%	30	S
Nickel sulphate	50%	30	S
Nitric acid	38%	30	S
Nitric acid	65%		U

The following chemical resistance values are provided only as a guide

Chemical	Concentration	Temperature °C	Resistant	Chemical	Concentration	Temperature °C	Resistant
Nitrobenzene			U	Sodium hydroxide	50%	23	S
N-n-di-methyl formamide				Sodium hydroxide	100%	50	S
O				Sodium hyperchloride	20%	30	S
Oil ASTM 1	pure		U	Sodium hyperchlorite	20%	30	S
Oil ASRM 2	pure		U	Sodium nitrate	43%	30	S
Oil ASTM 3	pure		U	Sodium phosphate (monobasic)	43%	30	S
Oil OB/22-AT	35%		U	Sodium sulphate	40%	30	S
Oil of Linseed	pure	30	U	Sodium thiosulphate	45%	30	S
Oil of olive	pure	23	U	Solna 100	30%	23	U
Oil of chicken	pure	23	U	Stearic acid	100%	50	S
Oil of beef	pure	23	U	Sulphuric acid	35%	23	S
Oil of pork	pure	23	U	Sulphuric acid	50%	50	S
Oleum			U	Sulphuric acid	96%		U
Oxalic acid	10%	30	S	T			
P				Tannic acid	10%	30	S
Pentane	pure	23	U	Tartaric acid	20%	30	S
Phenol	sol.	30	S	Tetralin	100%	23	U
Phophoric acid	85%	30	S	Tin chloride	62%	30	S
Potassium bi-chromate	20%	30	S	Toluene	pure	50	U
Potassium bromide	sat.	23	S	Tri-butyl phosphate			U
Potassium chloride	27%	30	S	Trichloroethylene	pure	50	U
Potassium hydroxide	50%	30	S	Triethanolamine		30	S
Potassium iodide	57%	30	S	V			
Potassium phosphate	17%	30	S	Vaseline oil	pure	30	U
Potassium sulphate	11%	30	S	W			
N-propanol	pure	23	S	Wine	pure	30	S
Propionic acid	100%	23	S	X			
Propyl ether			U	Xylene	pure	30	U
N-propyl nitrate			U				
Pyridine			U				
S							
Sodium chloride	sat.	23	S				

CODE:			
S	=	Satisfactory	
L	=	Limited application possible	
U	=	UNSATISFACTORY	
-	=	Not tested	
CONCENTRATION:			
Sat. sol.	=	Saturated aqueous solution	
prepared at 20°C (68°F)			
sol = aqueous solution with concentration above 10% but below saturation level			
dil. sol = diluted aqueous solution with concentration below 10%			
cust. conc = customary service concentration			



All Alderburgh products are manufactured to the highest quality, being subject to rigid quality control. However, the company cannot control conditions of application and use of its products, thus any warranty, written or implied, is given in good faith for materials only. Alderburgh Ltd will not accept any responsibility for damage or injury arising from storage handling, misapplication or misuse of its products. All transactions are subject to our standard condition of sale, copies of which are available on request.



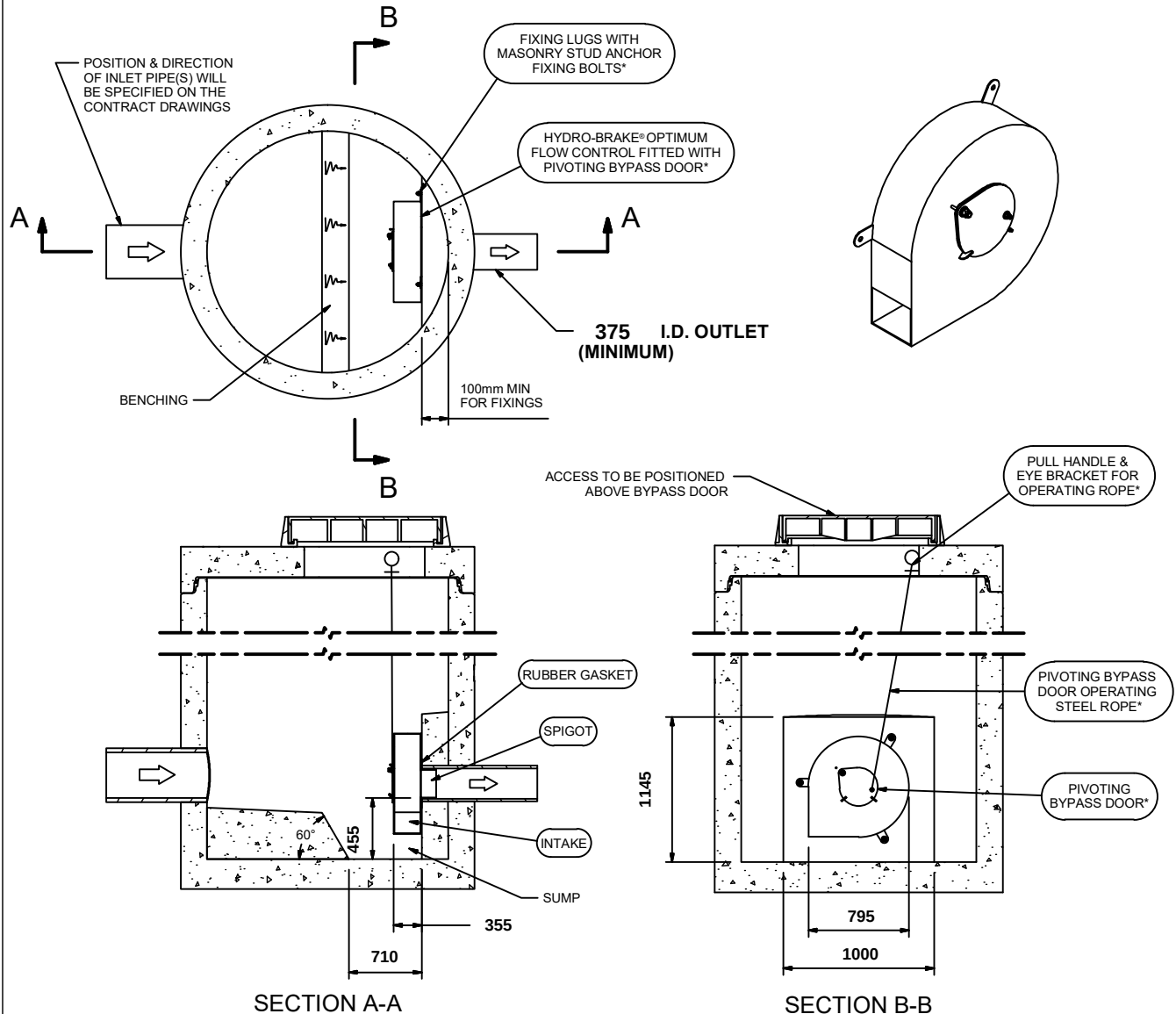
Alderburgh Limited.
Sladen Mill, Halifax Road, Littleborough, OL15 0LB.
For Further Assistance Tel: 01706 374416, Fax: 01706 376785
E&OE. Without Guarantee.

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.700	72.000
Flush-Flo™	0.461	71.948
Kick-Flo®	0.636	68.688
Mean Flow		51.242

Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet



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

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

DESIGN ADVICE



The head/flow characteristics of this SHE-0348-7200-0700-7200 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International®

DATE	6/3/2019 2:32 PM
SITE	Circle Square Plot 234
DESIGNER	Andrew Losty
REF	CS

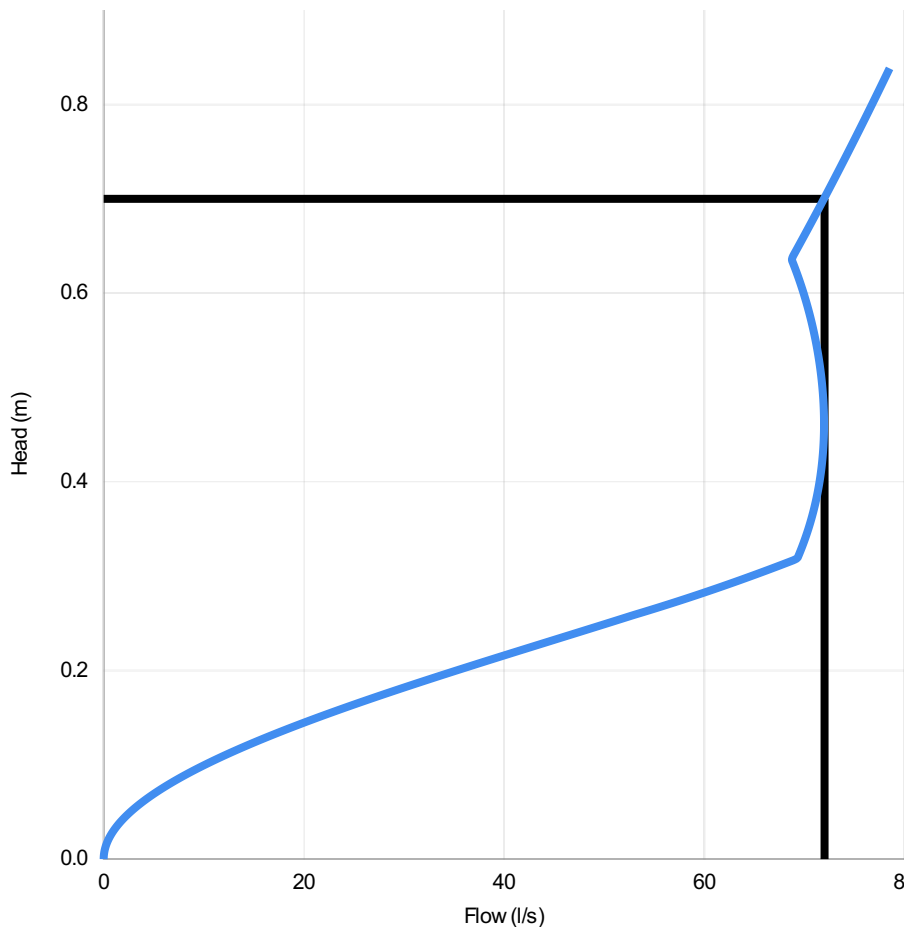
SHE-0348-7200-0700-7200
 Hydro-Brake® Optimum

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.700	72.000
Flush-Flo	0.461	71.948
Kick-Flo®	0.636	68.688
Mean Flow		51.242



PT/329/0412



Head (m)	Flow (l/s)
0.000	0.000
0.024	0.636
0.048	2.489
0.072	5.464
0.097	9.458
0.121	14.359
0.145	20.044
0.169	26.380
0.193	33.218
0.217	40.390
0.241	47.701
0.266	55.016
0.290	61.922
0.314	68.142
0.338	69.996
0.362	70.718
0.386	71.263
0.410	71.641
0.434	71.866
0.459	71.948
0.483	71.896
0.507	71.718
0.531	71.420
0.555	71.002
0.579	70.465
0.603	69.803
0.628	69.009
0.652	69.496
0.676	70.728
0.700	71.937

DESIGN ADVICE



The head/flow characteristics of this SHE-0348-7200-0700-7200 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International

DATE	03/06/2019 14:32
Site	Circle Square Plot 234
DESIGNER	Andrew Losty
Ref	CS

SHE-0348-7200-0700-7200
Hydro-Brake Optimum®

The Smart Sponge® Family

Smart Filter® Chamber Range

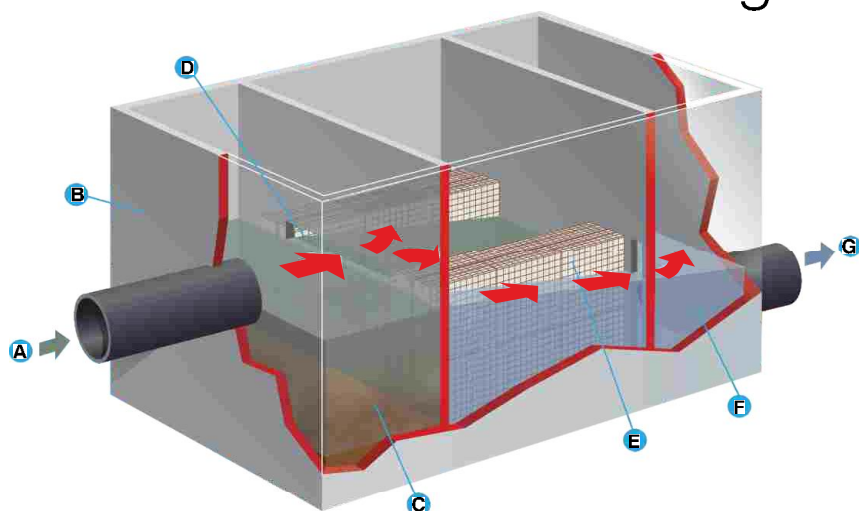


Diagram Key

- A. Inflow
- B. Lightweight composite chamber with vehicle loading capability
- C. Chamber with weir to trap sediment
- D. Flow passes through Smart Paks and through side orifices
- E. Smart Paks to absorb hydrocarbons
- F. Collection chamber with outlet to sewer
- G. Outflow

Note: Arrows show direction of water flow

Smart Filters® for Highways, Large Catchment Areas etc:

Specifically designed for extreme storm events and larger flow situations, the basic principles of the smaller Smart Filters® can be adapted to virtually any flow and also adapted to site restrictions.

The Smart Filters® come in several standard modular chamber sizes but can also be manufactured bespoke to suit specific site conditions. Contaminated wastewater enters the system into a settlement chamber and passes through an orifice into a distribution chamber and then is passed through the Smart Sponge® units (Paks) which removes up to 95% of all hydrocarbons. The cleaned water then passes through purpose designed side orifices to exit the treatment chamber via the outlet pipe.

Smart Filter's® Advantages:

- Treats 100% of the storm flow
- Removes 95% of hydrocarbons
- Removes heavy metals & silts
- Can cope with extreme conditions
- Shallow excavations
- Low head drop
- Modular design
- Virtually any flow catered for
- Waste product 100% recyclable
- Easy maintenance procedure



Smaller Smart Filter® being lowered into position

Prod No.	Description	Dimensions WxLxH	Treated Flow (l/s)	Max Flow (l/s)	380 x 380 Smart Paks	Pak Height (no.)	Aux Silt Capacity	Max Oil Capacity	Head Drop across unit
SF03.1A	Smart Filter® 44 l/s Flow, c/w 200mm dia pipes	0.8 x 1.2 x 1.2	10.9	44	4	1	190 litres	48 litres	380mm
SF03.1B	Smart Filter® 88 l/s Flow, c/w 300mm dia pipes	0.8 x 1.2 x 1.2	21.7	88	8	1	75 litres	96 litres	380mm
SF03.2A	Smart Filter® 130 l/s Flow, c/w 300mm dia pipes	1.2 x 1.8 x 2.0	32.6	130	12	1	210 litres	144 litres	380mm
SF03.2B	Smart Filter® 265 l/s Flow, c/w 300mm dia pipes	1.2 x 1.8 x 2.0	70.4	265	24	2	420 litres	288 litres	760mm
SF03.2C	Smart Filter® 350 l/s Flow, c/w 300mm dia pipes	1.2 x 1.8 x 2.0	94	350	32	2	75 litres	384 litres	760mm
SF03.3A	Smart Filter® 400 l/s Flow, c/w 300mm dia pipes	1.2 x 1.8 x 2.0	117	425	40	2	275 litres	480 litres	760mm

N.B. A suitable hydrodynamic separator (HDS) should be utilised prior to the Smart Filter® to remove the majority of silt from entering the filter. An auxiliary silt storage, is provided as a fail safe on all units. Treated Flow calculations are calculated according to first flush effect for typical storms.

THE SMARTER SOLUTION TO: Quick Installation & Maintenance

Passive Skimmers

It is intended that proactive checks are completed on a six monthly basis, any remedial work will be managed reactively.

1. Fix a tether rope to the absorbent Passive Skimmer and record the weight in Kg
2. Fix the tether so that the Passive Skimmers can be recovered but allowing the skimmer to float freely.
3. Every 6 months withdraw the Passive Skimmer, shake off excess water and check and record weight. If weight is above trigger value replace skimmer.

Passive Skimmers are deemed spent if their weights are greater than:

Size	Dry Weight	Spent Weight
PS1313 (Small)	0.5kg 	2.0kg (approx. 2.4 litres) 
PS1818 (Medium)	0.9kg 	3.6kg (approx. 4.2 litres) 
PS2727 (Large)	1.9kg 	7.6kg (approx. 9.0 litres) 



Passive Skimmers are available in Small, Medium and Large packs
PS1313 (Small) shown

Smart Gully Adaptor®

Smart Gully Adaptor® Instructions for SGA Installation and Maintenance.



Insert the back plate into the rodding eye of the gully



Slide the front plate with Smart Pak in down onto the back plate



Back plate will lock into position on the tabs provided



Remove the front plate by sliding upward



Weigh the unit with Smart Pak in



Remove and replace spent Smart Pak



Install new Smart Pak and refit

Size	Dry Weight	Spent Weight
SMPK (150X150X62.5)	0.5kg 	1.2kg (approx. 1.4 litres) 

Smart Paks - Smart Filters®

It is intended that proactive checks are completed on a six monthly basis, any remedial work will be managed reactively.

1. Open the top of the Smart Filter® & using the plastic ties lift out the wire cage containing the Smart Paks, snip the plastic ties & remove the individual Smart Pak, shake off excess water & weigh the Smart Pak and record this on the maintenance schedule.
2. If the recorded weight is greater than twice the dry weight, replace the Smart Paks accordingly with new ones. If less than twice the weight, a changeover date can be calculated based on the relative weights.
3. Relace the Smart Paks back in the wire cages, renewing any plastic ties to hold the cages closed and slide the cage back into

Size	Dry Weight	Spent Weight	Size	Dry Weight	Spent Weight
SMPK12122.5	1.95kg 	4.6kg 	SMPK15152.5	2.9kg 	7.2kg 
SMPK12123	2.22kg 	5.5kg 	SMPK 15153	3.5kg 	8.7kg 

Smart Pak weights before and after application (assumes a non confined unit).

THE SMARTER SOLUTION TO: Quick Installation & Maintenance

Ultra-Urban® Filters

The Ultra-Urban® Filters can be installed as a drop in unit with a collar or as a slot in system secured to the side of the gully or inlet with brackets.

The Ultra-Urban® Filter Is Easily Installed

Installation time varies depending upon mounting devices selected. A single mounting bracket made of 16-gauge galvanised steel is required for the installation of the Curb Opening (CO) series. The Ultra-Urban® Filter should not be installed where modules obstruct the drain pipe outlet. The size of the drain should allow room for stormwater over flow. The Drain Inlet (DI) series Ultra-Urban® Filter will suspend from the drain into the catch basin through a structural plastic mount and funnel mechanism.



Low Maintenance

The Ultra-Urban® Filter should be serviced as needed to remove sediment and debris, according to expected debris accumulation. The sediment and debris can be quickly vacuumed out of the modules through the opening of the drain with conventional maintenance equipment. Under normal operating conditions the Ultra-Urban® Filter should be replaced every 1-3 years.

Prod No.	Dry Weight	Spent Weight	Litres
UUF1414N	9.1kg 	27kg 	21Ltr
UUF1414H	5.9kg 	17kg 	13Ltr
UUF1616N	10.9kg 	32kg 	25Ltr
UUF1616H	8.2kg 	24kg 	19Ltr
UUF2020N	13.6kg 	40kg 	31Ltr
UUF2020H	10kg 	30kg 	24Ltr



Smart Sponge® & Smart Sponge® PLUS technology effectively and efficiently reduces the amount of coliform bacteria, debris and hydrocarbons, to keep the UK's beaches, marinas, airports regulations in compliance with Bathing Water Directive and Stormwater regulations.





**A revolutionary new product
that is taking the
global surface water market
by storm**



BRITISH WATER
expertise worldwide

**Naylor Industries plc - more
than 100 years of manufacturing
and supply to the
Construction Industry**

- Vitrified clay pipe systems for trench and trenchless installation
- Thermachem - Chemical Drainage and Industrial Ceramics
- Band-Seal couplings for the repair of and connections into existing pipelines
- Plastic Land Drainage, Twinwall Ducting Systems and Access Boxes
- Yorkshire Flowerpots, a range of frostproof plant pots



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IN PEOPLE** | Silver



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ENVIRONMENTAL**

CLOUGH GREEN
CAWTHORNE
BARNSELY
SOUTH YORKSHIRE, S75 4AD

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A MEMBER OF THE NAYLOR GROUP OF COMPANIES



Sustainable Roof Gardens

NBS Q37 Extensive Sedum Blanket Green Roof

Roofing Specification For: Affinity Living, Manchester.

Specification Reference Number: 01-12800

Site Contract Address: As above

Specifier Address:
Helix Roofing Contractors Ltd
9 Breck Road, Wallasea
Wirral, CH44 3BE
Email dave@helixroofing.co.uk

**Date of
Issue:
19/02/19**

This proposal specification is valid for a period of 12 months from the above date of issue. In the event that the project is not completed during this period, contact should be made with IKO

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Q37 Project: Affinity Living, Manchester, Green roof areas – Levels 7, 8 &16
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Technical Services Department prior to the commencement of the works.

Q37 GREEN ROOFS

To be read with Preliminaries/ General Conditions.

GENERAL

110 EXTENSIVE GREEN ROOF

- Roof type: As per J31
Substrate: As per J31.
Slope: As per J31.
- Waterproofing: **PermaTEC Anti Root Monolithic Hot Melt System**
- Thermal insulation: As per J31
- Protection: As per J31
- Moisture control layers: IKO Green Plasfeed 20 Drainage /Retention Board
- Growing medium: IKO Extensive Growing Substrate.
Depth: Minimum 50mm
- Vegetation: IKO Green Sedum Blanket
- Accessories: IKO Green Roof Garden Systems as required.

PERFORMANCE

210 GENERAL DESIGN

- Green roof and associated features: Complete the detailed design.
- Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

255 MAXIMUM PERMITTED GREEN ROOF LOADS

- Dead loads:
 - Green roof layers: _____ .
- Imposed loads:
 - Activity: _____ .
 - Vegetation: _____ .
 - Allowance for additional loads during construction: _____ .
- Service loads: _____ .
- Requirement: Restrict site activities to ensure that design loads are not exceeded, or submit proposals for temporary supports.

PRODUCTS

310 INVERTED ROOF INSULATION

- Manufacturer: As per J31
Product reference: As per J31.
- Type: As per J31
Compressive strength: Refer to Manufacturers data sheets.
- Edges: Refer to Manufacturers data sheets.
- Integral topping: Refer to Manufacturers data sheets.
- Thickness: As per J31

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- 320 ROOT BARRIER: - **PermaTEC Anti Root Monolithic Hot Melt System**
- Manufacturer: IKO Group plc, Appley Lane North, Appley Bridge, Wigan, Lancashire, WN6 9AB. Tel; 01257 255771
Product reference: 24116080
Material: Hot melt rubberised bitumen membrane containing a specially formulated root resistant treatment. Laid in two layers each nominal 3mm thick with polyester reinforcement mesh between
Thickness: 6mm
- 350 DRAINAGE/MOISTURE RETENTION LAYER PLASFEED 20
- Manufacturer: IKO Group plc, Appley Lane North, Appley Bridge, Wigan, Lancashire, WN6 9AB. Tel; 01257 255771
Product reference: 79900020
- Material: Composite drainage board consisting of a dimpled perforated sheet of HDPE with a non-woven filter fabric bonded to the top surface.
Depth: 20mm
- Infill: Not Required
- 360 FILTER MEMBRANE IKO FILTER FLEECE
- Manufacturer: IKO Group plc, Appley Lane North, Appley Bridge, Wigan, Lancashire, WN6 9AB. Tel; 01257 255771
Product reference: 30010136.
- Material: Spun Bonded polyester filter layer.
Mass: 110g/m²
- 370 EXTENSIVE GROWING MEDIUM IKO Green Extensive Growing Medium
- Manufacturer: IKO Group plc, Appley Lane North, Appley Bridge, Wigan, Lancashire, WN6 9AB. Tel; 01257 255771
Product reference: 30020001
- Material: Crushed Brick Crushed Concrete, Pumice and Organic Composted Pine Bark Chippings.
Depth: Minimum 50mm
- Ameliorant/ conditioner: Not Required
- Declaration of analysis: Submit.
- 400 SEDUM BLANKET
- Manufacturer: IKO Group plc, Appley Lane North, Appley Bridge, Wigan, Lancashire, WN6 9AB. Tel; 01257 255771
Product reference: IKO Sedum Blanket
Planting Mix: TBC
Thickness; 30mm
- 420 EDGE RETAINING PROFILE IKO DRAINAGE EDGE RETENTION TRIMS
- Manufacturer: IKO Group plc, Appley Lane North, Appley Bridge, Wigan, Lancashire, WN6 9AB. Tel; 01257 255771
Product reference: tbc
- Material: Galvanised metal
- Height: to suit growing medium

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- 430 INSPECTION CHAMBERS IKO GREEN INSPECTION CHAMBERS
- Manufacturer: IKO Group plc, Appley Lane North, Appley Bridge, Wigan, Lancashire, WN6 9AB. Tel; 01257 255771
Product reference: 50080000
 - Material: Powder Coated Steel.
 - Size: 300 x 300 x 80mm.
Depth: 80mm
 - Access covers: Powder Coated Steel
 - Features: Lockable Lid.
- 440 VEGETATION BARRIER TO GREEN ROOFS
Material: 20-40 mm washed pebbles.
Depth: To match soft landscape depth. .
Width: Minimum 300 mm.
- 450 ROOF DRAINAGE OUTLETS TO GREEN ROOFS
- Manufacturer: As specified
 - Product reference: TBA
 - Material: Cast Iron.
 - Size: TBA
 - Fixing: Strictly in accordance with Manufacturer's Instructions.
- 460 IRRIGATION SYSTEM – IF SPECIFIED BY CLIENT
- Supplier: TBA
 - Type: Project specific system designed and installed by irrigation supplier in accordance with Services Consultant's specification and requirements in .
 - Features: Irrigation to be provided manually by covered water tap located in each terrace.

EXECUTION

- 710 INSTALLATION GENERALLY
- Preparation: Clear all surfaces of debris.
 - Timing: After certification of waterproof membrane integrity.
 - Surface condition: Visually inspect waterproof membrane, report any damage.
 - Faults in waterproof membrane: Report.
 - Contamination: Do not use materials detrimental to healthy plant growth.
 - Storage: Do not overload.
 - Point loads: Avoid.
 - Outlets: Do not block.
 - Outlet grilles: Installed.
- 720 ADVERSE WEATHER
- Unfinished work: Secure from damage and wind uplift.
 - Conditions: Do not install or work with frozen materials.

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730 INSTALLATION OF INVERTED ROOF INSULATION

- Preparation: Clear roof of other trades.
- Condition of substrate: Clean.
- Fitting: Loose lay.
- Joints: Butt together.
 - End joints: Stagger.
- Cutting: Minimize.
 - Perimeters and upstands: Fit full sized pieces.
 - Penetrations: Cut cleanly and fit closely.
- Stability: Springing and rocking not permitted.
- Protection: Cover to prevent wind uplift.

740 ROOT BARRIER INSTALLATION - **PermaTEC Anti Root Monolithic Hot Melt System**

- Joints: N/A.
- Overlaps: N/A. PermaTEC Anti Root offers seamless root protection.
- Upstands: Extend to top of growing medium.

770 DRAINAGE LAYER INSTALLATION

- Extent: Continuous over entire roof area.
- Fitting: Loose lay directly on to geotextile on suitable insulation.

780 FILTER MEMBRANE INSTALLATION

- Joints: Minimize.
- Overlaps (minimum): 150 mm.
- Fitting: Loose laid to perimeter and where drainage layer has been cut in accordance with manufacturer recommendations.
- Upstands: Extend to top of growing medium.

790 GROWING MEDIUM INSTALLATION

- Handling: Minimize.
Conditions: Handle in the driest condition possible. Do not handle or install when wet or frozen.
- Layers:
 - Depth Minimum 50mm
 - Sequence: Gently firm each layer before spreading the next.

800 VEGETATION BLANKET INSTALLATION

- Handling blankets:
- Timing: Lay within 36 hours of lifting from growing position.
- Excessive stacking: Not permitted.
- Material loss (maximum): 3% of total surface area.
- Growing medium condition: Thoroughly watered.
- Laying blankets:
 - Dry, damaged, frosty or waterlogged blankets: Do not lay.
- Orientation: Diagonal or perpendicular to slope of roof.
- Joints: Stagger. Butt together or slightly overlap to prevent gaps. Do not stretch blankets.
- Edges: Finish with whole blankets.
- Consolidation: Firm as laying proceeds to ensure full contact with the growing medium. Do not use rollers.
- Dressing: As specified.
- Application: Brush in to fill joints.
- Watering: Thorough, immediately after laying and dressing.

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830 INSPECTION CHAMBER INSTALLATION

- Location: Install centrally over drain outlet.
- Orientation: Align parallel with adjacent features.
- Bedding: Not required.
- Backfill: 20/40mm washed pebbles.
- Surround: Minimum 300mm.

COMPLETION

910 INSPECTION

- Timing: Before handover.
- Give notice (minimum): 3 days.

920 COMPLETION

- General: Leave the works in a clean, tidy condition.
- Surfaces: Clean immediately before handover.
- Outlets: Clean and clear of obstructions.
- Completed green roof: Protect from adjacent or high level working.

930 DOCUMENTATION

- Timing: Submit at handover.
- Contents:
 - Growing medium declaration of analysis.
 - Manufacturers' guarantees and warranties.
 - Procedures for maintenance of the green roof.
 - Record drawings showing the location of planting and associated features.
- Number of copies: 2

Contact: **IKO PLC,**
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ROOF GARDEN FINISHES – IKO GREEN'S GENERAL GUIDANCE

Inspection and Approval

The finished waterproofing membrane must be inspected, and approved by IKO Green Technical Personnel, before any roof garden finishes are applied. Where following trades are to work on the roof, proper protection must be afforded the finished waterproofing and additional inspection/ testing of the membrane carried prior to the application of the roof garden finishes.

Install IKOgreen Plasfeed 20 unrolled and loose laid (**dimples down**) directly onto the insulation or finished waterproofing membrane abutting drainage and edge retention system and outlet protection grilles. Rolls should be laid overlapping the geotextile layer on to the previously laid roll. Install material under all green roof areas (including the vegetation barrier). In windy conditions, it may be necessary to temporarily weight down areas installed, prior to the surface finishes being applied.

IKOgreen Filter Fleece should be laid, where the selvedge of the IKOgreen Plasfeed 20 is insufficient to provide continuity of the filter layer. It should be installed at perimeter details and penetration upstands, with 100mm lap joints dressing 100mm on to the Plasfeed 20 geotextile.

Lay **IKO Extensive Growing Substrate**, directly on to the surface of the Plasfeed 20, to a depth of 50mm. Include for installation of slow release fertiliser.

Install around all perimeter upstands, rooflights, vents, and outlets etc, a vegetation barrier of 20/40mm rounded washed stones approximately 300mm wide, to the depth of the growing medium and sedum blanket. Install vegetation barrier to cover the edges of the sedum by 100mm to protect against wind uplift.

Lay **IKO Sedum Blanket** directly on to the surface of the Growing Medium, with joints staggered and close butted. Any excess pieces of sedum blanket must be removed from the roof immediately. Any areas of soil loss to the blanket must be filled and planted with Sedum cuttings.

Notes: -

1. On completion, the Sedum Blanket must be saturated with water to a volume of approximately 30%, to promote growth and assist with establishing the plants. It is the responsibility of the roofing contractor to liaise with the main contractor, to ensure that the Sedum Blanket does not dry out with the first month after installation.

2. Sedum Blankets are living plants, and as such the delivery to site and installation must be carefully programmed, with other site trades to ensure optimum propagation conditions. During hot weather, the Sedum Blankets must be unrolled on the day of delivery to site. Any rolls not used must be kept watered prior to final installation. During colder weather Sedum Blanket rolls must be rolled out and used within 48 hours.

3. Where other trades are likely to be working on the finished roof surface, the scheduling of the work must ensure that all of these works have been completed prior to the application of the landscape finishes. This will ensure that the Sedum Blanket is not used as a working platform and damaged after installation. Proper protection must be afforded the waterproofing from damage by other trades.

4. Extensive roof garden finishes need little maintenance however; proper protection must be afforded where ongoing building maintenance will be required (e.g. window cleaning etc). In these circumstances, the addition of paved walkway areas should be provided.

5. It is recommended that an external water supply is positioned with access to the roof, to allow watering of the sedum finishes in the early stages of development and to augment the natural rainwater supply in particularly dry conditions. This is the responsibility of the main contractor in new build projects and the client in the case of refurbishment.

FIRST YEAR MONITORING SCHEDULE

Sedum finishes are living plants, and as such, some care must be taken to ensure they reach maturity and flourish. To ensure the horticultural finishes establish quickly and grow to maturity at least two visits in the first year should be scheduled to carry out the following:

Application of suitable fertiliser to enhance growth and to aid establishment of the plant finishes.

A general appraisal of the plants should be made to ensure that areas of damage, or deficiencies, are quickly identified.

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Removal of weeds and or unwanted “self-set” plant growth (e.g. Buddleia) from the horticultural finishes before they become established.

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