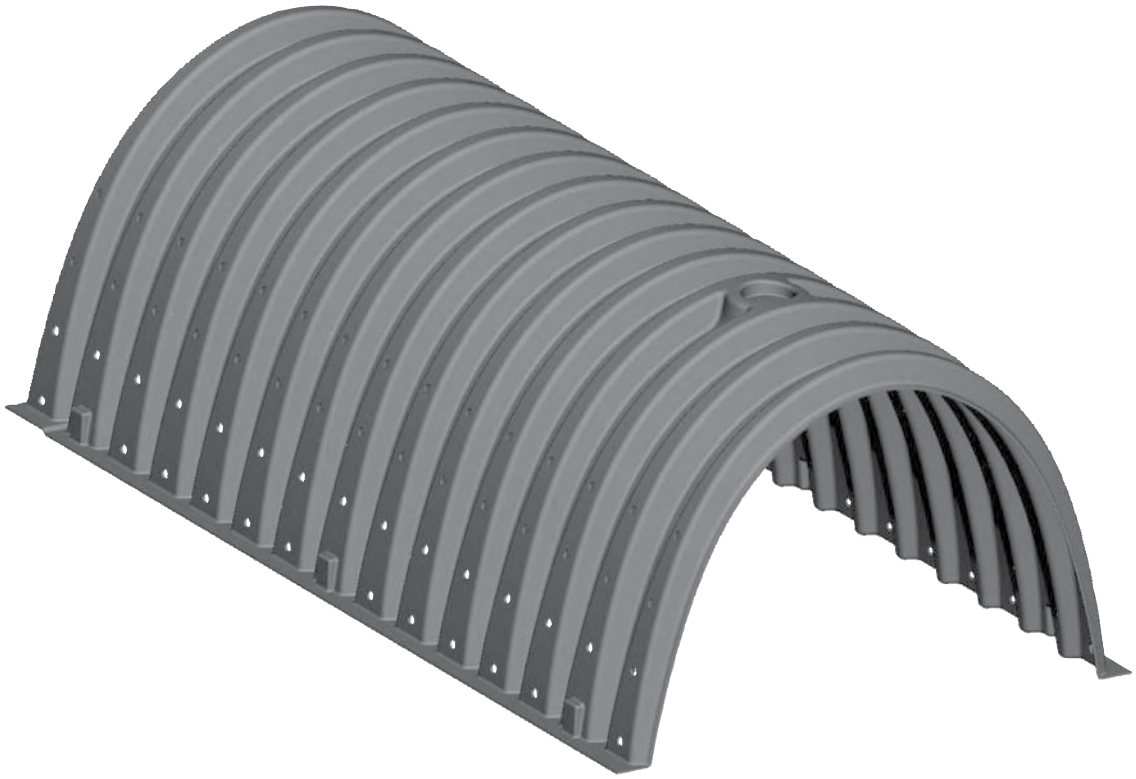
JFC CIVILS

HydroChamber

Installation Manual



BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4601

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Contents

Pre Installation

Excavation

HydroChamber Installation

HydroChamber Backfilling

Post Installation

Pre Installation

1.0 System Overview

Read design drawings (and HydroChamber Design Manual if necessary) until a full understanding of the system is established. Alternatively contact sales representative to arrange a site meeting.

2.0 Secure Site

The site should be secured in accordance with current legislation and dependant on site conditions. Reference should be made to the New Roads and Street works Act 1991, Code of Practice for Safety at Street works together with formalised procedures of any local authorities.

3.0 Receipt of Material

All materials delivered to site should be checked for damage prior to installation. All material should also be checked with delivery documentation to ensure everything is present and correct.

4.0 Site Storage

Do

- Store in secure site.
- Store on level ground.
- Store in easily accessible area.
- Take due care during unloading.

Do Not

- Store on uneven ground.
- Stack more than one pallet high.
- Store in area open to high winds.

Fig. 1 – Plate Bearing Test

5.0 Confirm

Double check all starting levels and dimensions on engineers drawing with actual levels on site. Notify site Engineer of any deviations.

Excavation

6.0 Excavate

Excavate to dimensions, levels and falls as detailed on Engineers drawing ensuring the length and width dimensions are taken at the base of excavation.

7.0 Establish CBR Value of Sub Soil

A CBR value of the subsoil is to be established from one of the methods outlined in Highways Agency Foundation Design Guidelines, see document no HD 25/95. The long term CBR value will establish the foundation depth required as outlined in tables 1 and 2 in section 13 - page 6. These tables consider the effects of trafficked and non-trafficked applications along with cover from top of HydroChamber to finished ground level. Once the CBR value is established the excavation depth may need to be deepened to accommodate the required foundation depth (see HydroChamber Design Manual for more details on levels).

8.0 Water Check & Blind Base

Ensure there is no water at the base of the excavation. If necessary pump out any excess water as the excavation must be free of ground water throughout the installation.

Blind base of excavation with sand to ensure no sharps are protruding. If ground is wet some broken stone may need to be laid before blinding (see site Engineer for more information).

9.0 Installation Supervision

All HydroChamber installations are to be supervised or installed by one of the following;

- Experienced JFC trained Installation team.
- Experienced JFC trained Supervisor.

10.0 Line Excavation

Line the excavation in the required geotextile / geomembrane / liner ensuring base and sides of excavation are completely covered. Ensure correct type of liner is being used in accordance with the operational mode of the chamber.

10.1 Permeable Systems

Permeable Systems / Soak-away use a non woven separator / filter geotextile as outlined in section 12.1 of the HydroChamber Design Manual.

The manufacturer's installation instructions should be followed along with best management practices as outlined below:

- Sides and base of excavation to be fully covered.
- Minimum lap of 300mm.
- Any damaged geotextile should not be used.
- Pins can be used to anchor the geotextile to the side of the excavation.

10.2 Impermeable Systems

Impermeable Systems use either an impermeable geomembrane protected on either side by a layer of non woven geotextile or a single layer of geosynthetic clay liner.

10.2.1 Geosynthetic Clay Liner

Geosynthetic Clay Liner as outlined in section 12.4 of the HydroChamber Design Manual.

The manufacturer's installation instructions should be followed along with best management practices as outlined below:

- Any damaged membrane is not to be used.
- Install liner on wall of excavation ensuring sides are covered to a minimum height of 300mm over the crown of the HydroChambers.
- Ensure a minimum of 300mm extends into the base of the excavation. This is used to form a joint with the subsequent layer.

Fig. 2 – Installing GCL Liner

- The liner can be anchored to the side of the excavation with steel pins once they are above the T.W.L.
- At the corner of the excavation the membrane must fold neatly ; avoid jointing at corners.
- Line the base of the excavation minimising the number of joints.
- Allow a lap of 100-200mm between successive layers (guide markings may be given on the liner).

Fig. 3 – Installing GCL Liner

- The powder sealant is applied between the laps of successive layers.
- The powder sealant must only be applied on a flat surface. All vertical joint must be sealed with a paste (water powder mix).
- Any tears or punctures that occur to the liner during installation must be patched using the same material.
- A paste (powder water mix) is applied to the back of the patch and the patch is then placed over the damaged area.

10.2.2 Geomembrane

Geomembrane as outlined in section 12.3 of the HydroChamber design manual is protected on either side by a layer on non-woven geotextile as outlined in section 12.2. The geomembrane is factory welded and supplied bespoke for each individual site. (on large systems where the membrane cannot be supplied as a single sheet, a number of sheets can be welded together on site)

The manufacturer's installation instructions should be followed along with best management practices as outlined below:

- Line the excavation in the required geotextile ensuring minimum laps of 300mm.
- Line the excavation with a sheet(s) of geomembrane.
- Take all steps to minimise the number of joints in the geomembrane.
- Any damaged membrane or geotextile should not be used.
- Installation methods should minimise the need to walk on the geomembrane surface reducing the risk of damage.
- The geomembrane is covered with a layer of non woven geotextile ensuring a minimum lap of 300mm.
- The geomembrane should not be visible on the sides or base of the excavation.
- Any small damage caused during installation may be repaired by suitable means as recommended by the manufacturer.
- Factory welded joints should be accompanied by a certificate of conformity from the supplier / manufacturer.
- On site welding to be accompanied with a certified of leak tightness.

11.0 Install Perforated Distribution Pipe

This pipe passes from the inlet to outlet manhole allowing water in and out of the system. The pipe is to have four standard perforations on every other dwell and laid with no perforation directly on the base of the pipe to allow dry weather flow straight through.

11.1 Impermeable System

Install the perforated distribution pipe on top of the impermeable geomembrane / liner as outlined on engineer's drawings. Ensure a solid foundation under pipe as per standard detail.

Fig. 4 – Impermeable System Distribution Pipe

11.2 Permeable System / Soak-away

Install the perforated distribution pipe on top of the foundation stone at the same level as the HydroChambers. See Section 14 - page 7.

12.0 HydroSeal Joint

For impermeable systems where a pipe needs to pass through the membrane / liner a HydroSeal coupler is installed on the pipeline either side of it. The HydroSeal comprises of two flanged couplers, a neoprene seal and 4 - 8 bolts depending on diameter of pipe.

Ensure the membrane does not fold or crumple in a manner that will affect the leak tightness of the seal as the HydroSeal is installed. The membrane is then trimmed to the internal bore.

The flanged coupler on the outside of the membrane / liner is fitted with a closed cell neoprene gasket to form a watertight seal.

Fig. 5 – HydroSeal Watertight Pipe Joint

It is recommended that both the inlet and outlet manholes are installed prior to installation of the HydroSeals. This allows the liner / geomembrane to be backfilled uniformly on either side minimising any possible damage to the liner / geomembrane.

13.0 Foundation Stone Installation

All pipe work **must** be surrounded with a minimum of 150mm 8/12mm clean crushed chip.

Install 35-50mm clean washed crushed stone to required depth (see section 7 - page 3 - and table 1 and 2 below). Compact with a vibrating roller and blind with 8/12mm clean crushed chip to a level finish.

If foundation rippling / movement is visible after compaction contact site engineer. Do not install system on a soft foundation.

Fig. 6 – Foundation Stone Installed

HydroChamber Foundation Requirements for **Live Traffic Loads**					
Soil Type	**Condition**	**CBR Value**	**Foundation Depth**		
			<1.5m Cover	1.6m - 2.0m Cover	2.1m - 2.4m Cover
		<2%	*seek advise from a Geotechnical Engineer*		
Sandy Clay / Boulder Clay	"firm[1]"	2%	0.3m	0.6m	0.9m
Sandy Clay / Boulder Clay	"stiff[2]"	3%	0.3m	0.3m	0.6m
Sand / Gravel	"compact[3]"	15%	0.15m	0.3m	0.3m

Table. 1 – Foundation Depths for Live Traffic Loads

HydroChamber Foundation Requirements for **Dead Soil Loads**					
Soil Type	**Condition**	**CBR Value**	**Foundation Depth**		
			<1.5m Cover	1.6m - 2.0m Cover	2.1m - 2.4m Cover
		<2%	*seek advise from a Geotechnical Engineer*		
Sandy Clay / Boulder Clay	"firm[1]"	2%	0.3m	0.5m	0.6m
Sandy Clay / Boulder Clay	"stiff[2]"	3%	0.3m	0.3m	0.3m
Sand / Gravel	"compact[3]"	15%	0.15m	0.15m	0.15m

Table. 2 – Foundation Depths for Dead Soil Loads

Note:
Following the CBR test on the subsoil the foundation depth required (see tables above) may be greater than the initial design. If so increase the foundation depth below the level of the membrane / liner to the required depth. This will ensure there are no changes to the invert and cover levels on site.

Notes:

1. *Condition assessed following Building Regulations 1997, Technical guidance Document A, Structure –'firm' sandy clay or boulder clay soil can be moulded by substantial pressure with the fingers and can be excavated with a spade, or see BS5930:1999. Soil stratum to be a minimum of 600mm thick beneath underside of granular fill.*
2. *Condition assessed following Building Regulations 1997, Technical Guidance Document A, Structure –'stiff' sandy clay or boulder clay soil cannot be moulded with the fingers and requires a pick or pneumatic or other mechanically operated spade for its removal, or see BS5930:1999. Soil stratum to be minimum 600mm thick beneath underside of granular fill.*
3. *Condition assessed following Building Regulations 1997, Technical Guidance Document A, Structure – 'compact' granular soils require pick for excavation; a wooden peg 50mm square hard to drive beyond 150mm, or see BS5930:1999. All sands and gravels should be proof-rolled as described in clause 613.7 of National Roads Authority Specification for Roadworks (NRA SRW) Series 600 Earthworks. Soil stratum to be minimum 600mm thick beneath underside of granular fill.*

14.0 Chamber Installation

The HydroChambers are laid out across the width of the excavation from one end, two to three chambers deep depending on the reach of the track machine.

- Place the required number of chambers (see Engineers drawings) across the excavation 2 to 3 chambers deep.
- Maintain minimum spacing as shown in figure 9 - page 8.

Fig. 7 – First Section Layout

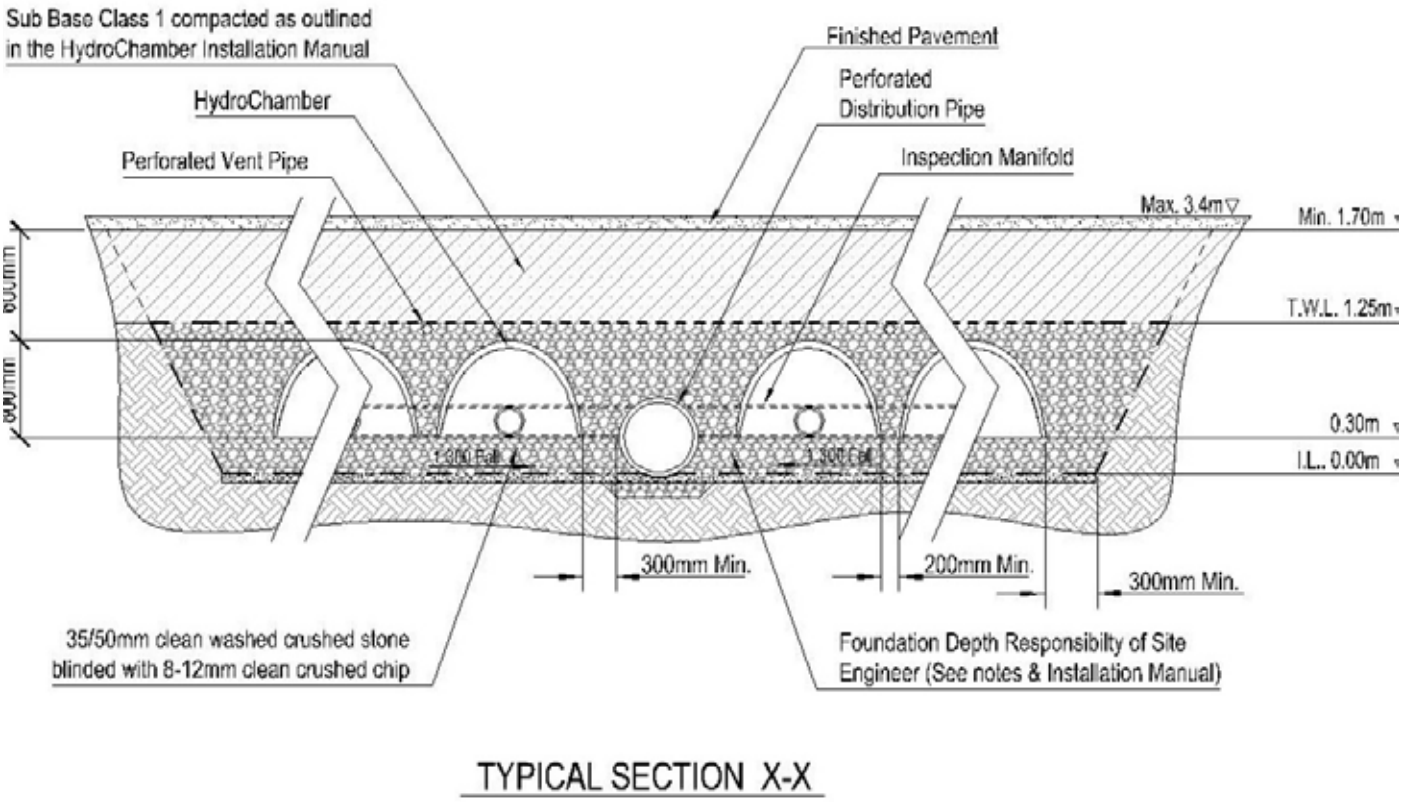

Fig. 8 – Layout Cross Section

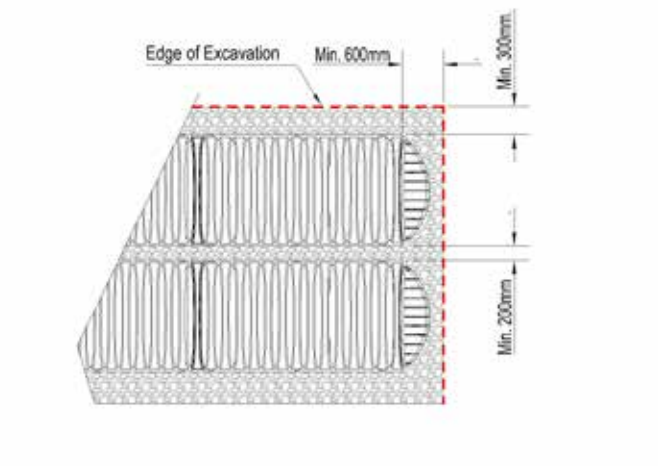

Fig. 9 – HydroChamber Layout Spacing

- The chambers must sit flat on the ground all along its length. In order to achieve this, the 10mm chip is raked to a flat level finish as shown in figure 10.
- Do not backfill chambers that are rocking on the base or have gaps under the feet.

Fig. 10 – Levelling the base

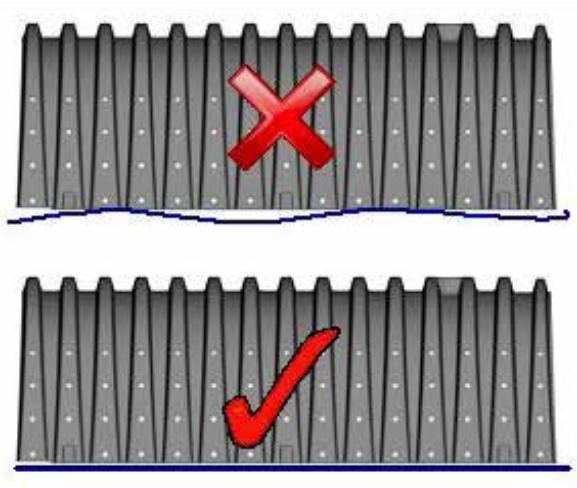

Fig. 11 – Base Condition

14.1 Chamber Assembly

The HydroChambers assemble together in one orientation only. Ensure the following instructions are carried out.

- The HydroChambers are assembled together with overlapping ribs.
- The last rib on the opposite end of the chamber to the inspection port assembles over the small rib beside the inspection port on the next chamber.
- All chambers must be assembled in the correct orientation and confirmed prior to backfilling.

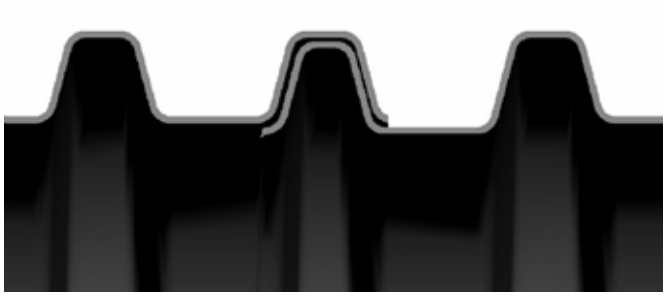

Fig. 9 – HydroChamber Layout Spacing

14.2 End-Cap Assembly

There are two HydroChamber end-caps,

- EC01 – standard pipe cut outs
- EC02 – Domed End cap

EC01 end caps are used where the manifold connections are made.

EC02 end caps are used where there are no pipe connections.

- Place end cap under the last corrugation of the HydroChamber.
- All end-caps are screwed in 2-3 equally spaced points through the centre of the last rib of the HydroChamber. (This prevents any movement during backfilling)

Fig. 13 – Screwing End Cap in Place

14.3 Manifold Assembly & Installation

The Manifold is normally installed on two chambers either side of the main distribution pipe but can be installed on any number of chambers as per engineers design. They can also be installed on the inlet or outlet side depending on specification.

- Cut the manifold pipes to the correct size ensuring a tight joint with no play.
- Place some stone around manifold to secure before commencing backfilling.
- The level of the manifold connection with distribution pipe can differ and is dependent upon design specification.
- A riser pipe is installed at the manifold connection before backfilling (maintenance and inspection).

Fig. 14 –Manifold Installation

HydroChamber Backfilling (Sections)

15.0 Backfilling Methods

There are two methods that can be used to backfill the stone around the HydroChambers and is usually dependent on site conditions and available plant.

1. Track machine works on top of the backfilled chambers. This method can be used provided there is enough cover over the chambers for the plant to operate (see tables 3 & 4 - page 11).
2. Track Machine works in the excavation on top of the foundation stone. Usually used for heavy plant and/or low cover areas.

For either method level markers are attached to the crown of the installed HydroChamber, evenly spaced across the whole installation. These act as level indicators for the track machine operator during stone placement. Markers can also be used as inspection ports if required.

15.1 Method 1

Start backfilling from one end with 35/50mm clean washed crushed stone. Backfilling **cannot** be carried out from the sides as the stone will push the chambers sideways altering the spacing between rows.

- Start the backfill by carefully dropping a small amount of stone over the crown of the chambers working across the width of the excavation.
- All pipe work **must** be surrounded with a minimum of 150mm 8/12mm clean crushed chip.
- The interlocked chambers must not move during this process maintaining a consistent gap between adjacent rows.
- This locks the chambers in place and prevents movement during remaining backfilling.
- Once chambers are locked in placed complete backfill to a minimum height of 150mm (recommended 200mm) above the crown of the chambers.

Fig. 15– Backfilling Stone

- Install 12 meters of 100mm vent pipe (see Engineers drawings) on top of stone and run into the inlet manhole i.e. highest point for venting.
- Vent pipe may be installed at the end depending on where backfilling was started from.
- Once backfill stone reaches the required level it is covered in a layer on filter / separator geotextile to prevent fines migrating into the system.

Fig. 16– Backfilling Near Completion

- Backfill continues to the minimum cover level for the plant being used as outlined in tables 3 and 4. Backfill material is dependent upon the finished use of the site i.e. trafficked or non-trafficked (see table 5 & 6)

  Note: It is useful to get the stone tipped along the bank of the excavation. Therefore the track machine has easy access to the stone

- Lay down next section or chambers and backfill as outlined above. Continue in sections until the end of the excavation is reached where the end caps are installed.

Fig. 17– Track Machine Over Chambers

15.2 Method 2

Backfill from one end with the track machine in the base of the excavation on top of the foundation stone. This method is used when dictated by site conditions or plant size (see tables 3 and 4 in section 15.4 - page 11).

- Start the backfill by carefully dropping a small amount of stone over the crown of the chambers working across the width of the excavation
- The interlocked chambers must not move during this process maintaining a consistent gap between adjacent rows.
- This locks the chambers in place and prevents movement during remaining backfilling.
- Once chambers are locked in placed complete backfill to a minimum height of 150mm (recommended 200mm) above the crown of the chambers
- Install 12 meters of 100mm vent pipe (see Engineers drawings) on top of stone and run into the inlet manhole i.e. highest point for venting.

Fig. 18 – Track Machine Working in Base

- Vent pipe may be installed at the end depending on where backfilling was started from.
- Once backfill stone reaches the required level it is covered in a layer on filter / separator geotextile to prevent fines migrating into system.
- Prepare base for next section at the reach of the track machine.
- Continue in sections until the end of the excavation is reached.

15.3 Rutting

Rutting cause by construction plant should be minimised through compaction and the use of good material. If rutting does occur as shown in figure 18 and 19, the cover levels in tables 3 & 4 **must** be taken from the base of the rut.

Fig. 19 – Excavator Rutting

Fig. 20 – Dumper Rutting

15.4 Backfill Tables

Maximum Axel Loads During Construction		
Minimum Cover Depth Over Chambers	**Clay Soil Backfill** (Green Area)	**Stone Backfill** (Trafficked Area)
450mm	N/R	N/R
600mm	4 Ton	6 Ton
750mm	6 Ton	8 Ton
950mm	8 Ton	10 Ton

Table 3 – Max. Construction Axel Loads

Maximum Excavator Loads During Construction		
Minimum Cover Depth Over Chambers	**Clay Soil Backfill** (Green Area)	**Stone Backfill** (Trafficked Area)
450mm	N/R	N/R
600mm	10 Ton	15 Ton
750mm	12.5 Ton	20 Ton
950mm	15 Ton	25 Ton

Table 4 – Max. Excavator Loading

15.5 Compaction Tables

Backfill Details Under Green Areas (non - trafficked)			
Layer	**Material**	**Compaction**	**Compaction Equipment**
Foundation layer	35-50mm Clean Washed Crushed Stone	Compacted to table 6/4 MCDHV Vol.1	Vibrating Roller max gross weight 3,000kg
Backfill Layer 1	35-50mm Clean Washed Crushed Stone	No Compaction Required	n/a
Backfill Layer 2	As dug material	No Compaction Required	n/a

Table 5 – Green Area Compaction

Backfill Details Under Trafficked Areas			
Layer	**Material**	**Compaction**	**Compaction Equipment**
Foundation layer	35-50mm Clean Washed Crushed Stone	Compacted to table 6/4 MCDHV Vol.1	Vibrating Roller max gross weight 3,000kg
Backfill Layer 1	35-50mm Clean Washed Crushed Stone	No Compaction Required	n/a
Backfill Layer 2	Sub Base Type 1 or 2	Compacted to table 8/4 in MCDHW Vol.1	• Vibrating Roller max gross weight 3,000kg • Maximum dynamic force of 10,000kgs • Minimum cover for vibrating roller 600mm

Table 6 – Trafficked Area Compaction

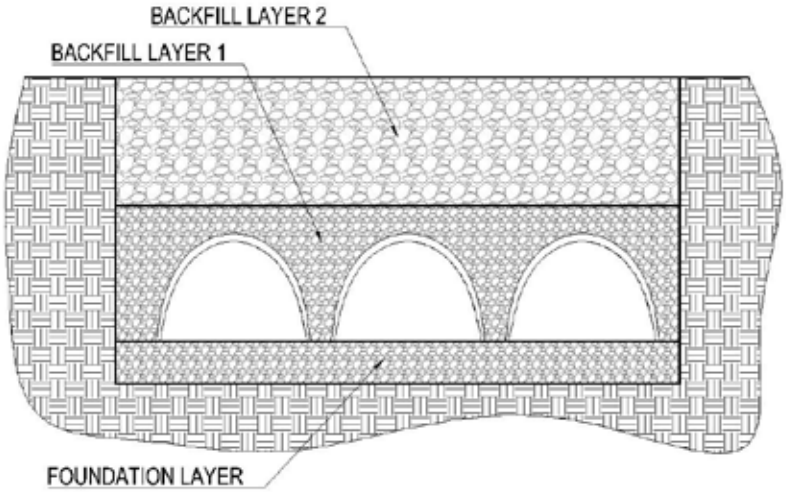

Fig.21 – Blackfill Layers

Post Installation

16.0 Sign-Off

The installation supervisor will complete an installation report which is to be signed by the contractor. Any variations in the installation will be noted with reasons for variation provided. This report is then filed for future reference.

17.0 Finished Area

Post installation the area is to be fenced off from construction traffic. The site is then finished to the design specification, example A) Green amenity area as shown in figure 22, example B) Car park as shown in figure 23.

Fig. 22 – Amenity Area

It is the responsibility of the contractor to ensure that construction traffic post installation and pre site handover does not exceed that outlined in tables 3 and 4 in section 15.4 - page 11.

All shrubs / foliage planted over the installation should be selected so that when mature there roots do not reach the membrane / liner surrounding the system. Advice on correct plant selection can be sought from a landscape architect.

Fig. 23 – Car Park

18.0 Inspection and Maintenance

The HydroChamber Storm Water Management System is designed to allow easy access inspection and maintenance. Access is provided by a number of methods detailed below.

There are two main options available for inspection, visual inspection and camera inspection. Depending on the maintenance programme requirements the most suitable will be selected.

18.1 Visual Inspections

Visual Inspections can be carried out from one of the following points:

- Inlet / Catchpit manhole
- Outlet / Control Manhole

The manholes are to be de-sludged prior to entry and standard safety precautions should be taken when working in confined spaces.

Fig. 24 – Distribution Pipe Inspection

18.2 Camera Inspections

Camera inspection can be carried out from one of the following points:

- Access point on distribution pipe
- Inlet / Catchpit manhole
- Outlet / Control Manhole
- Chamber Inspection port

Fig. 25 – Chamber Inspection

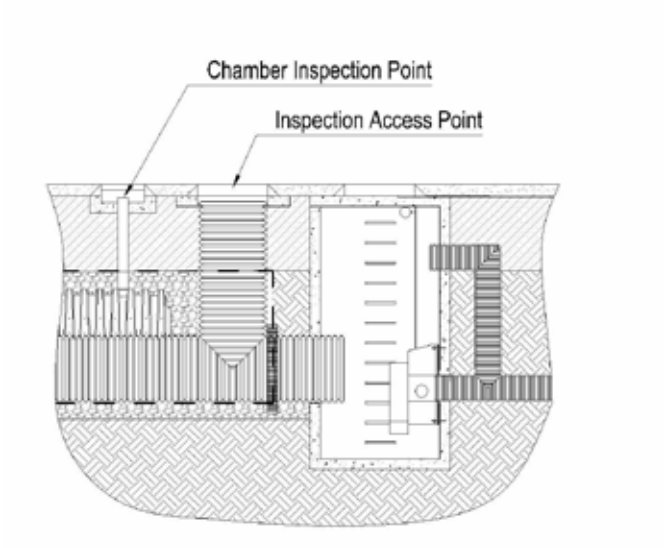

Fig. 26 – Inspection Points

A 100mm pipe may be installed in the inspection port of any chamber for camera access from the ground. The designer can specify any number of inspection ports at various locations as deemed necessary.

18.3 Inspection and Maintenance Programme During Construction

A large amount of settable solids are present in the stormwater network during construction and this is mainly due to the silt / grit present in construction runoff. To account for this the following inspection and maintenance programme is recommended.

- Inspect both inlet catchpit manholes monthly.
- If either catchpit is 50% full, de-sludge both with a standard vacuum tanker.
- If a large amount of silt is present a silt screen may be fitted in the inlet manhole during construction.
- When construction is finished a full camera inspection is recommended on the main distribution line between inlet and outlet manholes.
- If any contaminants are found in the line it should be flushed / jetted and the catchpit manholes de- sludged.
- Best management practices should be maintained to minimise containments entering the stormwater network.

18.4 Inspection and Maintenance Programme During Construction

When the developed site is in use post construction the intensity of contaminants entering the system greatly reduces. The following inspection and maintenance programme is recommended.

- Inspect both inlet catchpit manholes at six monthly intervals in the first year.
- If either catchpit is 50% full, de-sludge both with a standard vacuum tanker.
- After the first year camera inspect the main distribution pipe and associated inspection points.
- If any contaminants are found in the line it should be flushed / jetted and the catchpit manholes de-sludged.
- After the first year inspection should be carried out annually or bi-annually depending on activity and maintenance carried out as deemed appropriate.
- Best management practices should be maintained to minimise containments entering the stormwater network.

19.0 Safety Information

19.1 Composition

Hazardous ingredients – None.

Types of Material – medium / high density polyethylene, bentonite, polypropylene geotextile.

19.2 Hazards Identification

Nature of Hazard - There are no health risks from the products during normal use.

19.3 First Aid Measurers

Eye Contact – Plastic Materials may cause physical irritation in the eyes. Wash out with large amounts of water. If irritation persists seek medical advice.

Skin Contact – Not applicable.

Inhalation – Not applicable.

19.4 Fire Fighting Measurers

Extinguishing Media – On small fires use any hand held extinguisher type. On large fires use water.

Fire Hazards – Melting Plastic may flow and spread in a large fire. Products or fire will be black thick toxic smoke.

Material Characteristics – Polyethylene products will burn in the presence of a flame between 105-115°C.

Protective Equipment – Wear self contained breathing apparatus and protective clothing.

19.5 Handling and Storage

There are no hazards associated with the finished product, however when cutting it is recommended that the correct tools are used e.g. Handsaw or Alligator Saw. During cutting avoid inhaling dust. Pallets of HydroChambers must be stored on level ground and must not be subject to strong winds. Pallets weigh approximately 750kgs, all equipment used to unload and move the pallets must be capable of lifting the weight safely. Prolonged (over one year) storage in direct sunlight should be avoided. The HydroChambers should not be stored near any fuel storage areas or any other solvents. HydroChambers should be stored in an area where they will not get damaged due to construction plant or vehicles.

19.6 Personal Protection

Respiratory Protection – Not required under normal conditions, when cutting use a disposable half mask to the standard FFP2S.

Hand Protection – Wear impervious strong gloves.

Eye Protection – Wear safety glasses when cutting.

Skin Protection – Wear Overalls.

19.7 Site Hazards

Working below ground – HydroChambers are installed underground and all necessary safety regulations must be adhered to when excavating the trench, work below ground and backfilling the trench.

19.8 Environmental Information

Stability – These products are stable at temperatures up to normal operating conditions.

Biodegradability - Plastic products are not readily biodegradable but are not detrimental to terrestrial wildlife.

Aquatic Toxicity – Not toxic to marine life.

19.9 Other Information

As the handling, storage, use and disposal are beyond our control, JFC disclaim all liability for loss, damage or other expense during handling and storage.

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