



LSW HydroChamber

Stormwater Management System

Installation Manual



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Pre Installation

1.0 – System Overview

Read design drawings (and 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

On-Site Preparation

5.0 - Confirm

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

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 plate bearing test or similar approved is to be carried out after the initial excavation to determine the CBR value of the soil beneath the foundation stone. This will be carried out in conjunction with tables 1 and 2 in section 12 to establish an adequate foundation depth.

Once the CBR value is established the excavation depth may need to be deepened to accommodate the required foundation depth. (see design manual for more details on levels)

8.0 – Water check

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.

9.0 – 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. See design manual for details on specification and approved suppliers.

Note: The liner should be carefully installed ensuring it is not torn, punctured or installed in a manner that would effect its performance.



Fig. 1 – Installing GCL Liner

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10.0 – Install Perforated Drain Pipe

Install perforated pipe as detailed on engineers drawings to drain the foundation stone when using an impermeable system. Position on drain pipe may change on site depending on falls, position of outlet manhole etc. (Clarify with site engineer)

Note: This is only necessary on an impermeable system i.e. sealed.



Fig. 2 – Foundation Stone Installed

11.0 – HydroSeal Joint

Use the HydroSeal coupler to make a watertight connection between the liner and drain pipe if necessary i.e. impermeable systems only. (see figure 3.)



Fig. 3 – HydroSeal Watertight Pipe Joint

12.0 – Foundation Stone

Install 35-50mm clean washed crushed stone to required depth (see section 7.0 and table 1 and 2 below). Compact with vibrating roller as outlined in tables 5 and 6. Ensure base is level and flat to +/- 15mm after compaction with no sudden steps. Blind with 10-15mm clean washed crushed chip if necessary.

HydroChamber Foundation Requirements for Soil Loads (Green Areas non trafficked)					
Soil Type	Condition	Assumed CBR	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. 1 – Foundation Depth Earth Load

HydroChamber Foundation Requirements for Traffic Loads (Car Park Traffic)					
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. 2 – Foundation Depth Traffic Loads

Note: If foundation matting or rippling is visible after final compaction contact site engineer. Do not install system on a matting or rippling foundation.

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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.

HydroChamber Installation (Sections)

13.0 – 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 across the excavation 2 to 3 chambers deep ensuring the silt collection row is covered under and over with a layer of high flow filter woven geotextile as outlined in the design manual.



Fig. 4 – HydroChamber Layout

* Ensure the following **minimum** distances are followed:

- 150mm between each chamber (measured from the outside of the foot)
- 300mm between chamber and side of excavation
- 600mm between chamber and end of excavation

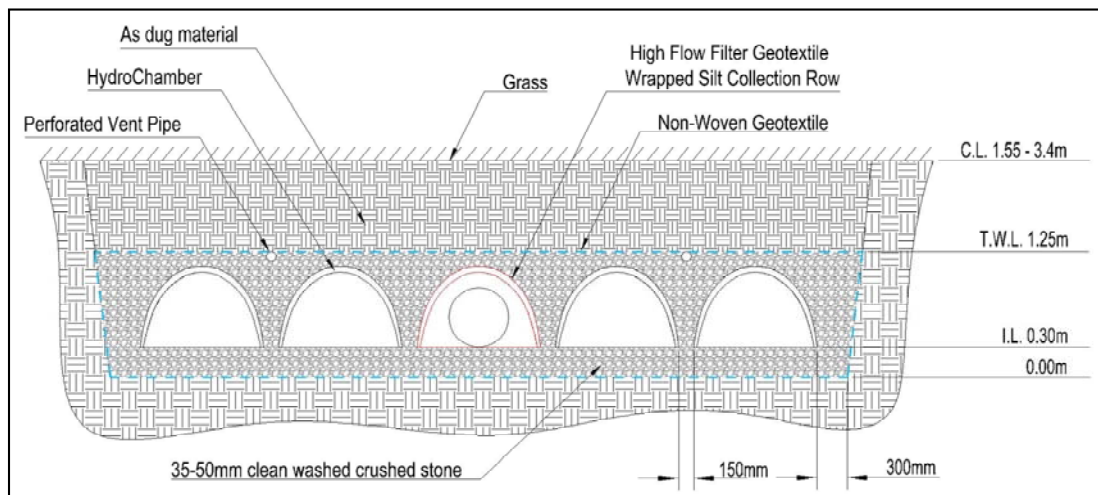


Fig. 5 – Foundation Depth Traffic Loads

13.1 – Silt Collection Row

The silt collection row is connected directly to the inlet manhole upstream and outlet / control manhole downstream using a suitable end cap (recommended HC800-EC03). A Ø600mm pipe is used to make the connection, this allows access for inspection and maintenance.

A layer of high flow filter geotextile is laid out under the chamber. A second layer is then placed over the top of the chamber ensuring all the arch of the chamber is covered. (see figure 6).

If using a wide roll the layer under the chambers can be offset and wrapped back around the top of the chambers.

High flow geotextile should be installed carefully so as not to cause any punctures or tears.



Fig. 6 – Silt Collection Row

The silt collection row can be installed on any row depending on the position of inlet / outlet manholes but must be a minimum of two rows in from the edge of the excavation (see fig. 6 above).

13.2 – 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

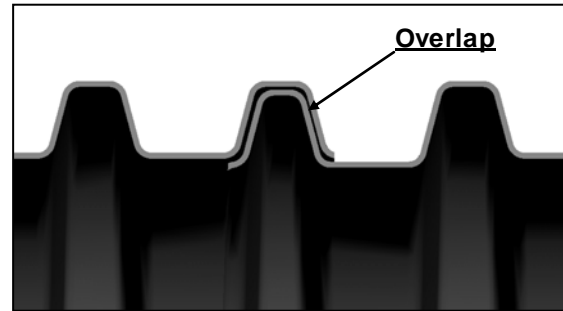


Fig. 7 – Corrugation Overlap

13.3 – End-Cap Assembly

There are three HydroChamber end-caps, one end-cap has standard pipe sizes cut out sections with the second end-cap having a domed design with vertical ribs. The third end cap has a receiver for a 600mm pipe to ensure pipe invert is at base of foundation stone. (see design manual for more details)

- Install domed end caps on all rows apart from silt collection row.
- Install end cap with 600mm coupler on silt collection row.
- Install connection pipe between manhole and end-cap at standard fall.
- All end-caps are screwed in 3-4 equally spaced points through the centre of the last rib of the HydroChamber.

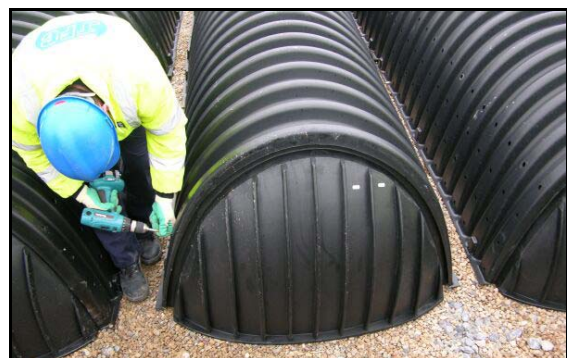


Fig. 8 – Screwing End Cap in Place

HydroChamber Backfilling (Sections)

14.0 – Backfilling Methods

There are two methods that can be used to backfill the stone around the HydroChambers.

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)
2. Track Machine works in the excavation on top of the foundation stone. Usually used for heavy plant and / or low cover areas.

14.1 – 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 chambers.

- 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 chambers.
- This locks the chambers in place and prevents movement during remaining backfilling.
- Once chambers are locked in place complete backfill to a minimum height of 150mm (recommended 200mm) above the crown of the chambers
- **Important**
Install 12 meters vent pipe in two places (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 (see design manual for more details)



Fig. 9 – Backfilling Stone

- Backfill continues to the minimum cover level for the plant being used as outlined in table 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 as each section is backfilled the track machine has easy access to the required stone



Fig. 10 – Backfilling Soil

- 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 as shown in figure 8.

14.2 – Backfill Tables

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

* Backfilled and compacted as per tables 11.2 and 11.3

Table 3 – Max. Axel Loads (Const.)

Maximum Track Machine Loads During Construction		
Minimum Cover Depth Over Chambers	Earth Backfill (Green Area)*	Stone Backfill (Trafficked Area)*
450mm	6 Ton	6 Ton
600mm	10 Ton	12.5 Ton
750mm	12.5 Ton	15 Ton
950mm	15 Ton	20 Ton

* Backfilled and compacted as per tables 11.2 and 11.3

Table 4 – Max. Track Machine Loads (Const.)



Fig. 11 – Construction Plant over Chambers

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 3000kg
Backfill Layer 1	35-50mm Clean Washed Crushed Stone	No Compaction Required	n/a
Backfill Layer 2	Sub Base Type 1 Capping 150mm Clause 804 before road surface	Compacted to table 8/4 in MCDHW Vol.1 After a cover level of 500mm is reached	Vibrating Roller max gross weight 3000kg Maximum dynamic force of 10,000kgs

Table 5 – Backfill Details under Green Area

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 3000kg
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 6 – Backfill Details under Trafficked Areas Areas

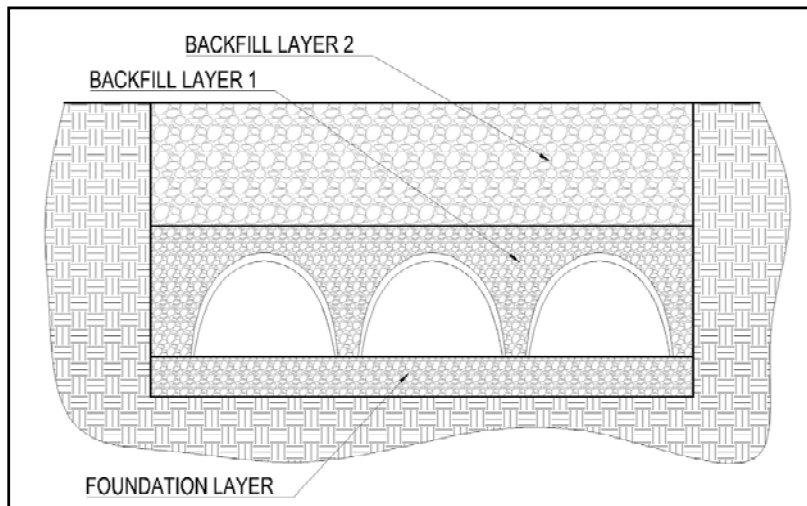


Fig. 12 – Layer Build Up

14.3 – Rutting

Rutting caused by construction equipment should be minimised through compaction and the use of good material. If rutting does occur as shown in figure 13 and 14, the cover levels in tables 3 & 4 **must** be taken from the base of the rut.



Fig. 13 – Track Machine Rutting



Fig. 14 – Dumper Rutting

14.4 – 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 where only large plant is available

- 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 chambers.
- This locks the chambers in place and prevents movement during remaining backfilling.
- Once chambers are locked in place complete backfill to a minimum height of 150mm (recommended 200mm) above the crown of the chambers
- Once backfill stone reaches the required level it is covered in a layer of protector / separator geotextile (see design manual for more details)



Fig. 15 – Backfilling in Base of Excavation

- Once the first section is backfilled prepare / level the next section of the foundation stone.
- Compact with vibrating roller as outlined in table 5 & 6. Ensure base is level and flat to +/- 15mm after compaction. Blind with 10-15mm clean washed crushed chip if necessary.

- Lay down next section or chambers and backfill as outlined previous. Continue in sections until the end of the excavation is reached where the end caps are installed as shown previously.
- Stone may be stockpiled along the sides of the excavation or in the base of the excavation depending on the depth.
- Large plant may be used to push in backfill material from the sides of the excavation once they do not pass over the chambers.
- Pull geotextile / liner covering the sides of the excavation in over the stone.



Fig. 16 – Working in Base of Excavation

Important

- Install 12 meters of perforated vent pipe in two places (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.
- Place a layer of non-woven separator / filter geotextile over top of stone.
- Backfill continues with suitable material to required cover level. This is done from ground level with plant limited to that outlined in tables 11.0 and 11.1.

Venting

15.0 – Venting

Connect perforated vent pipes laid down during installation to the inlet manhole and install a manhole grating as shown in figure 16 below to vent the system.



Fig. 16 – Grating on Inlet Manhole

Post Installation

16.0 – 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 17, example B) Car park as shown in figure 18.



Fig. 17 – Amenity Area



Fig. 18 – Car Park

It is the contractors responsibility to ensure the maximum loadings during construction do not exceed table 3 and 4. Maximum loadings during service can be seen in the HydroChamber design manual.

17.0 COSHH and Handling Information

17.1 – Composition

Hazardous ingredients - None

Types of Material - medium and high density polyethylene

17.2 – Hazards Identification

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

17.3 – 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

17.4 – 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.

17.5 – 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.

17.6 – 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

17.7 – 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.

17.8 – 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

17.9 – Other Information

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