

StormTrap[®] system Installation guide

SingleTrap™ model – Issue 2



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StormTrap® system

The StormTrap® system is a purpose-built stormwater detention and infiltration solution which provides a fully trafficable, below ground on-site detention system (OSD).

The system takes a unique design approach by connecting individual precast concrete modules into a single layer configuration that meets each project's requirements. This delivers a simple and flexible design solution without compromising above ground land use.

The growing popularity of the StormTrap® system is not only driven by its unique design and performance benefits, but by the significant installation economies it can provide. The modular design of the system means large detention volumes are delivered with the installation of each module. And because installers are able to use traditional construction processes, the installation can be completed in minimal time. Generally, it is expected that an individual StormTrap® module can be set in position in less than 10 minutes.

The StormTrap® system is available in two configurations to provide conventional detention, high early discharge or infiltration to ground water. The SingleTrap™ system and DoubleTrap™ system provide design solutions to meet volume requirements. This guide refers to the installation of the SingleTrap™ system.

The SingleTrap™ system is either founded on a strip footing to create a large infiltrative surface area, or founded on a conventional concrete slab for use as either a traditional detention basin or a basin with high early discharge.

The installation of the StormTrap® system is very simple:

1. Establish a suitable foundation.
2. Place modules row-by-row.
3. Apply Denso tape across the top of the module joins.
4. Backfill.

There are a number of time-lapse videos available from humes.com.au which demonstrate the construction sequence and methodologies undertaken during the installation of a StormTrap® system. The library of videos includes a variety of project sizes and configurations.

As the system is made from precast concrete it is extremely strong and trafficable to AS 5100 traffic loadings (other design loadings are also available). Once the system has been installed there is no requirement for any further structural work in the trafficable pavement. The system will not deflect during construction loading, which allows rapid backfilling, and it won't suffer creep, as can be experienced with some lightweight systems.

Design and installation standards

The StormTrap® system is designed and installed in accordance with the requirements of the following Australian standards:

- AS 3600-2018 – Concrete Structures Code
- AS 5100-2017 – Bridge Design Code
- AS 5100.2-2017 – Bridge Design – Design Loads
- AS 1597.2-2013 – Precast Reinforced Concrete Box Culverts – Large Culverts
- AS/NZS 1170.1-2002 – Structural design actions – Part 1: Permanent, imposed and other actions.

Specifications

Module details

There are a number of different StormTrap® modules available and their use and placement will depend on design requirements and site layout (refer to Figure 1).

While the length and width of the modules remains constant, the height, and subsequently the mass, will vary according to the leg height for the system. The leg height varies from 600 mm to 1,500 mm, and is adjustable at 50 mm increments within this range.

Some modules will contain openings to allow for stormwater pipes or culverts and maintenance access points. Inlets and outlets may be placed at varying invert and positions around the perimeter of the structure.

Depending on the overall size, each StormTrap® system will generally be designed with either 600 mm or 1,050 mm diameter openings for access through the roof at either end of the system. However, access openings may be in any location to fit in with specific site requirements. Designs can be modified to accommodate 900 mm x 900 mm grates.

Masses and dimensions

SingleTrap™ modules have a maximum internal leg height of 1,500 mm. The maximum mass of each module is shown in Table 1.

Table 1 – Masses and dimensions (1,500 mm height)

Module type	Mass (kg)	Length x width (mm)
I	6,730	4,000 x 2,350
II	4,320	2,000 x 2,350
III	7,660	4,000 x 2,350
IV	4,810	2,000 x 2,350
V	4,810	2,000 x 2,350
VI	8,590	4,000 x 2,350
VII	5,280	2,000 x 2,350

Figure 1 – A sample StormTrap® system layout and standard module types

IV	III	III	V
II	I	I	II
II	I	I	II
V	III	III	IV

Standard type I



Standard type II



Standard type III



Standard type IV



Standard type V



Standard type VI



Standard type VII



Handling and installation

Safety

Safety is a priority for Humes. It is important for all parties to observe safety requirements and regulations during transportation, handling, storage and installation, including wearing appropriate personal safety protection equipment.

It is the responsibility of the main contractor or installation contractor to produce a safe work method statement; we recommend that this statement complies with both the National Code of Practice for Precast Tilt-up and Concrete Elements in Building Construction, and local and state codes (where they exist). Personnel should follow any safety advice provided by the main contractor/installation contractor.

The precast concrete component should only be lifted using the appropriate lifting clutches which are fitted into the designated lift points via the cast-in anchors. All lifting equipment must be certified to lift the specific mass and approved for lifting heavy components. The mass of the StormTrap® modules will vary depending on its geometry; weights will be clearly marked on the precast units and in the relevant project drawings.

All lifting and placement must proceed with caution and strictly in accordance with all relevant occupational health and safety standards. Bumping or impact of modules can cause damage and should be avoided.

The advice in this publication is of a general nature only. Where any doubt exists as to the safety of a particular lift or installation procedure, seek the guidance of a professional engineer or contact Humes for advice.

Pre-delivery

To ensure the safe and efficient installation of the StormTrap® system it is important to undertake sufficient planning prior to its arrival on site.

Equipment requirements

The following list of equipment is required for a safe and efficient installation:

- tape measure
- a can of marking spray
- chalk line/masonry string
- pinch/crowbar
- stanley knife
- two ladders
- broom
- level
- four chains
- four five-tonne Swiftlift® clutches
- Swiftlift® clutches for manhole covers or risers
- swivel for chains
- safety harness for working at height
- 17 mm mastic and primer (supplied with StormTrap®)
- Denso tape (supplied with StormTrap®).

Site preparation

Before the StormTrap® system is installed, the concrete foundation must be poured (refer to the approval drawings supplied by Humes). The foundation details will depend on whether the system is required to provide stormwater detention or infiltration (refer to Figure 2 and Table 2 for an example).

Once the foundation is cured mark the outside edges of the system on the slab (as per the layout dimensions of the approval drawings).

Figure 2 – Example of a foundation plan

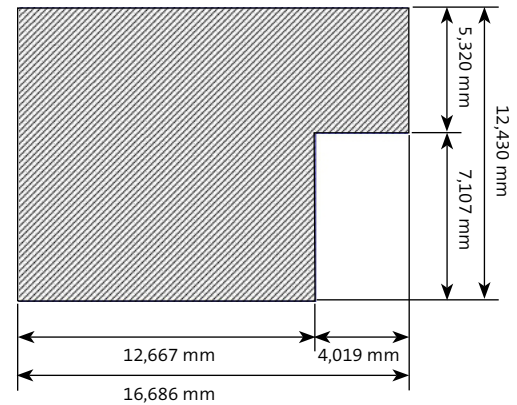
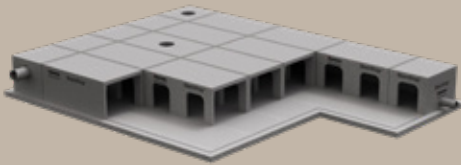
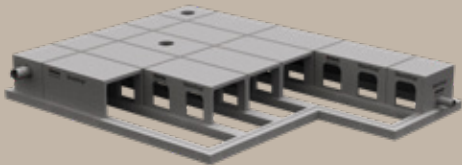
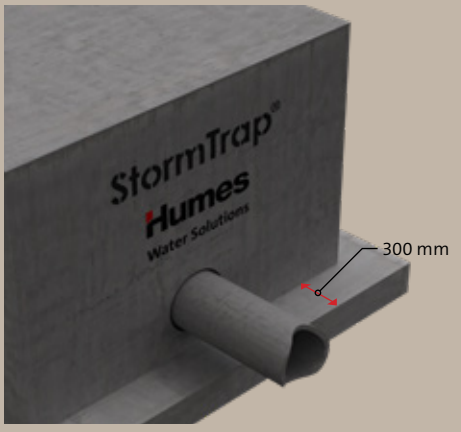
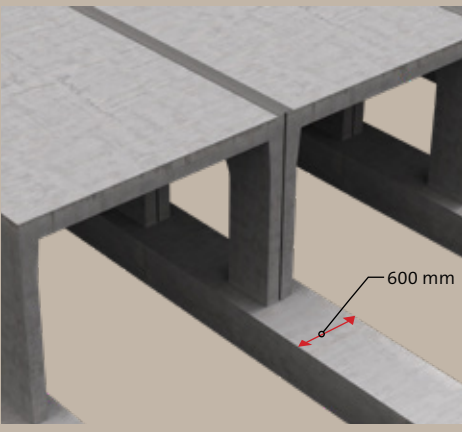


Table 2 – Foundation details

System type	Detention	Infiltration
		
Foundation	Continuous concrete slab	Strip footing
Dimensions	Slab extends 300 mm past the outer edge of the StormTrap® modules. 	Slab 'strips' are 600 mm wide running underneath the line of StormTrap® feet. 

Delivery

Prior to deliveries commencing, a pre-installation site meeting will occur with the contractor to finalise shipping plans including the sequencing of deliveries and the order of unloading and installing each of the modules.

The shipping plan will help to alleviate the double-handling of modules; save time and effort, make more efficient use of the crane, and reduce site congestion. The shipping plan will be provided to both the specifying engineer and contractor for sign off prior to commencing the delivery of modules to site (refer to Figure 3).

The StormTrap® modules will be delivered to site either on a semi-trailer or B-double depending on site access and the number of modules to be delivered. Each truck will typically contain 3-6 modules depending on the particular module type and mass. The first truck will typically take about 45 minutes to unload, the second truck about 30-45 minutes, and then each subsequent truck about 20-30 minutes.

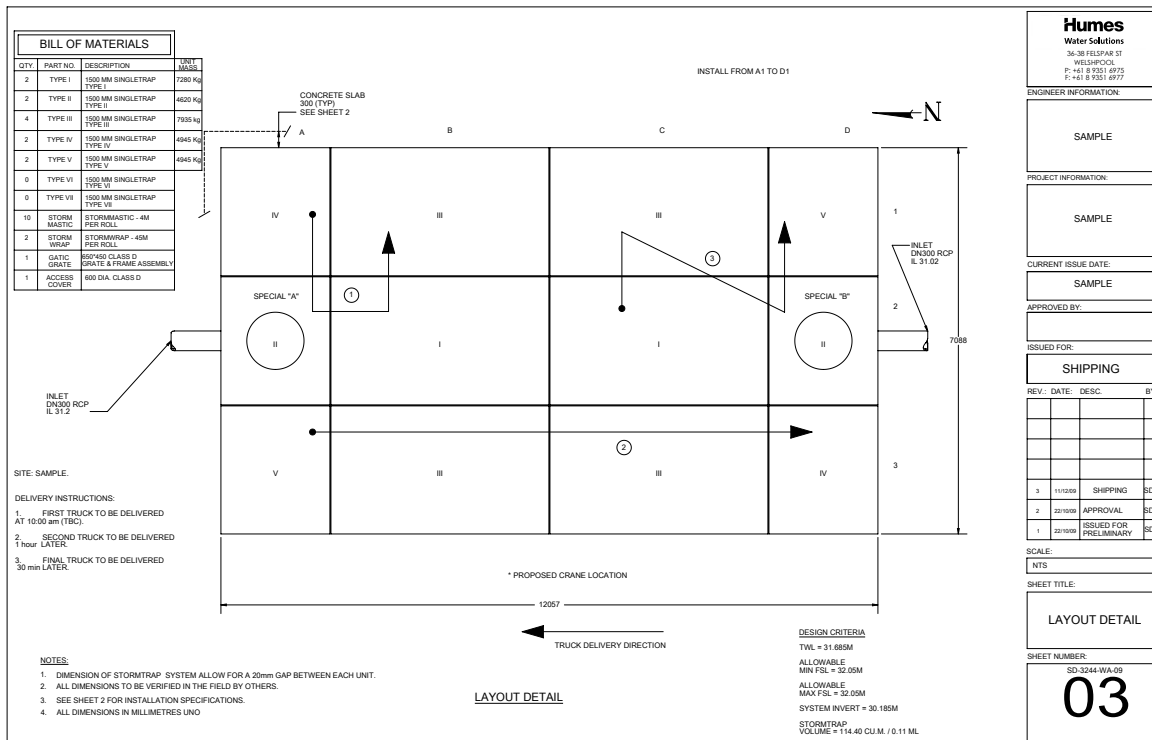
Lifting

All the precast units are supplied with cast-in lifting anchors to enable safe handling. To prevent stress and possible concrete cracking, all units must be handled using the cast-in lifting anchors and associated lifting clutches (lifting clutches can be obtained from the crane contractor or Humes). Installers should use tagged lifting equipment only. It is the installation contractor's responsibility to ensure the lifting clutches are available on site. The lifting points of anchors are clearly shown on the Humes drawings.

Wherever possible, all modular components should be lifted from the delivery truck and set directly onto the prepared substructure. Each module will take approximately 5-10 minutes to unload and set into position.

If for some reason temporary storage of the modules is required on site, they should be placed carefully on level, even ground, free of rocks and uniformly supported across the entire leg surface by using timbers. Modules should not be stacked on top of each other.

Figure 3 – Example of a shipping plan



Module installation

Top:
Step one

A representative of Humes Water Solutions will be present on site at the commencement of the installation (as required) to provide support to the contractor and observe deliveries and installation.

Middle:
Step two

Bottom:
Step three

The StormTrap® system is typically installed as follows:

1. Sweep the concrete slab/footings clean of dirt and debris.
2. A bead of 17 mm mastic is required between the slab and the base of the outer StormTrap® modules, such that the entire outer perimeter of the system is sealed. Note that the concrete slab extends 300 mm outside the outer perimeter of the StormTrap® system so the mastic should be placed 360 mm in from the outer edge of the slab
3. Secure the first module with four Swiftlift® anchors. Take care not to strike the modules together when you are unloading and lowering them. Be aware of pinch hazard at all times and don't walk or work under suspended loads.



- When lowering the first module into position, pause 50 mm above the concrete slab, then gradually lower it into position once it is aligned with the perimeter markings. Ensure the unit is square and the bottom of the module is on the foundation before you remove the lifters.



Top:
Step four

Middle:
Step five

Bottom:
Step six

- Installation of the remaining modules aligns with the first module installed. They can be simply butted up against each other, but on occasions there might be a small gap between them. The maximum allowable gap between each module is 20 mm.



- Continue to install the modules row-by-row, in the order shown on the shipping plan.



Top:
Step seven

Bottom:
Step nine

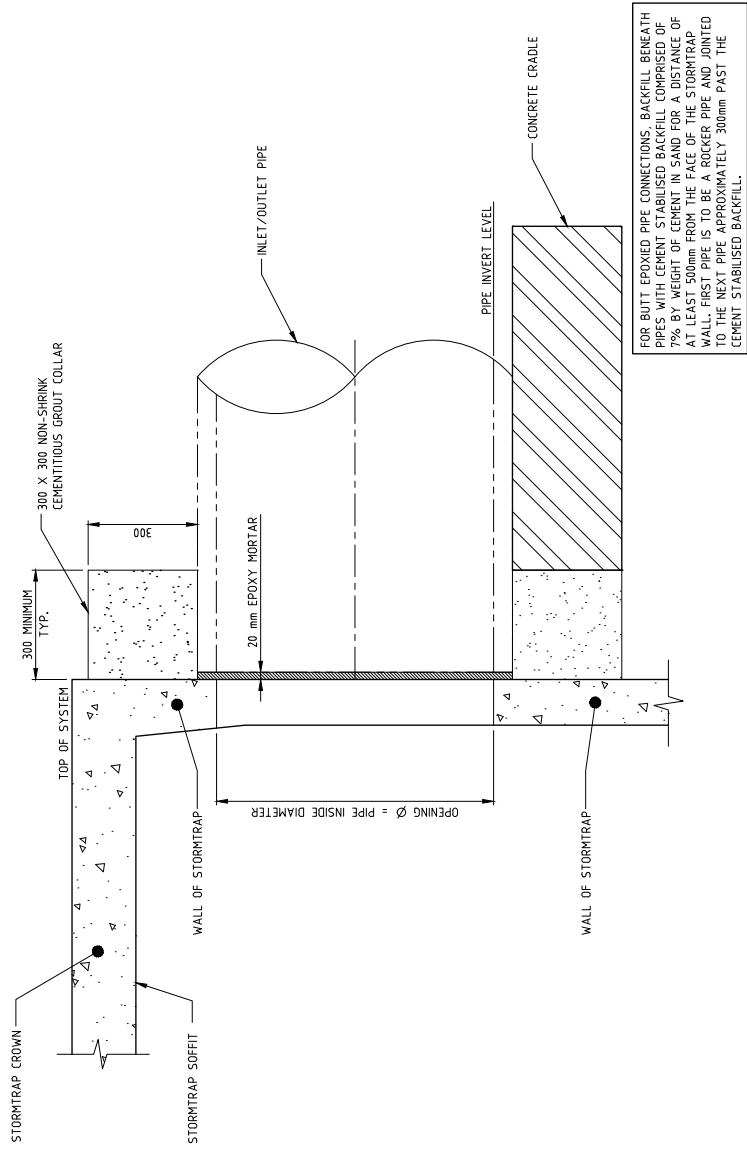
7. Once two or more rows of modules have been laid and checked, Denso tape is applied over all of the external joints starting from the base slab and over the top of the modules and down to the base slab on the opposite side.
8. Connect pipes. On most occasions the StormTrap® modules will be supplied with pipe penetrations suited to the type and class of pipe. On some occasions however it might be necessary to supply the modules with penetrations that only match the inside diameter of the pipes; this might be due to structural needs or limited depth to invert levels. If this is the case an epoxy butt joint connection will be required between the pipe and the StormTrap® module, an example of this is included in the Appendix. As always, the installation contractors should liaise with the design consulting engineers to check this connection detail for suitability.
9. When four rows of modules have been laid, checked and sealed, backfilling can then occur (refer to the notes page of the Humes StormTrap® project drawings).



Appendix

Epoxy butt joint connection example

ISSUE	DETAILS OF ALTERATIONS	DATE	BY	CHKD
0	ISSUED FOR MANUFACTURE		YML	KRB



TYPICAL BUTT EPOXY PIPE CONNECTION

SCALE 1:10

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DESIGNED BY: KRB DRAWN BY: YML CHECKED BY: YML APPROVED BY: HJE	DATE: 14-07-20 DATE: 14-07-20 DATE: 14-07-20 DATE: 14-07-20	ISSUE NO.: A2 EP-ST-PIPE-01 0 PLOT SCALE: 1:1

Contact information

National sales 1300 361 601

humes.com.au

info@humes.com.au

Head Office

18 Little Cribb St
Milton QLD 4064
Ph: (07) 3364 2800
Fax: (07) 3364 2963

Queensland

Ipswich/Brisbane
Ph: (07) 3814 9000
Fax: (07) 3814 9014

Rockhampton
Ph: (07) 4924 7900
Fax: (07) 4924 7901

Townsville
Ph: (07) 4758 6000
Fax: (07) 4758 6001

New South Wales

Grafton
Ph: (02) 6644 7666
Fax: (02) 6644 7313

Newcastle
Ph: (02) 4032 6800
Fax: (02) 4032 6822

Sydney
Ph: (02) 9832 5555
Fax: (02) 9625 5200

Tamworth
Ph: (02) 6763 7300
Fax: (02) 6763 7301

Victoria

Echuca
Ph: (03) 5480 2371
Fax: (03) 5482 3090

Melbourne
Ph: (03) 9360 3888
Fax: (03) 9360 3887

South Australia

Adelaide
Ph: (08) 8168 4544
Fax: (08) 8168 4549

Western Australia

Perth
Ph: (08) 9351 6999
Fax: (08) 9351 6977

Northern Territory

Darwin
Ph: (08) 8984 1600
Fax: (08) 8984 1614



National sales 1300 361 601

humes.com.au

info@humes.com.au

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