

## StormTrap<sup>®</sup> system Installation guide

DoubleTrap™ model – Issue 2



# Contents

<b>StormTrap® system</b>	<b>1</b>
Design and installation standards	1
<b>Specifications</b>	<b>2</b>
Module details	2
Masses and dimensions	2
<b>Handling and installation</b>	<b>3</b>
Safety	3
Pre-delivery	3
Equipment requirements	3
Site preparation	4
Delivery	5
Lifting	5
Module installation	6
<b>Appendix</b>	<b>9</b>
<b>Contact information</b>	<b>11</b>

# 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 DoubleTrap™ system.

The DoubleTrap™ system is made up of two layers of precast pieces. A lower (bottom) piece and an upper (top) piece join together to produce one DoubleTrap™ module.

The installation of the StormTrap® system is very simple:

1. Establish a suitable foundation.
2. Place bottom pieces row-by-row.
3. Apply 17 mm mastic sealant to external joints.
4. Place top pieces row-by-row to form the module.
5. Apply Denso tape across the top of the module joins.
6. Backfill.

There are a number of time-lapse videos available from [humes.com.au](http://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.

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. Lower modules can have one or more 1,050 mm diameter voids for infiltration systems. Inlets and outlets may be placed at varying inverts 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. While the StormTrap® system is not watertight, a mastic seal (200 mm wide StormWrap™ tape), is applied over all external joints of the modules to stop the ingress of soil and ground water into the system.

## Masses and dimensions

DoubleTrap™ modules consist of two units with a maximum 1,500 mm leg height. The maximum mass of each unit 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 layout of a DoubleTrap™ system**

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

**Standard type I (top)**



**Standard type II (top)**



**Standard type III (top)**



**Standard type IV (top)**



**Standard type V (top)**



**Standard type VI (top)**



**Standard type VII (top)**



# 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
- spirit level
- four chains
- four five-tonne Swiftlift® clutches
- Swiftlift® clutches for manhole covers or risers
- swivel for chains
- 20 mm spacers or gap gauge (available from Humes)
- 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 arrives on site, the appropriate foundation must be installed (as per the layout dimensions of the approval drawings).

Once the foundation is prepared and compacted, mark the outside edges of the system (as per the layout dimensions on the approval drawings).

A chalk line, spray-paint or equivalent are appropriate marking equipment.

**Note:** The StormTrap® system has a maximum laying gap between modules of 20 mm. Particularly with tall (3 m high) DoubleTrap systems, a small laying gap at the bottom of the modules can translate to a large gap at the top. Consideration should be given to applying a 20 mm layer of bedding sand on top of the foundation material so it can be screeded to produce a very flat bedding that won't result in large laying gaps.

Figure 2 – Example of a foundation plan

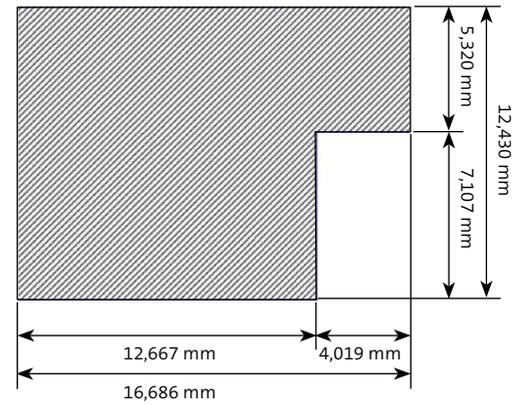
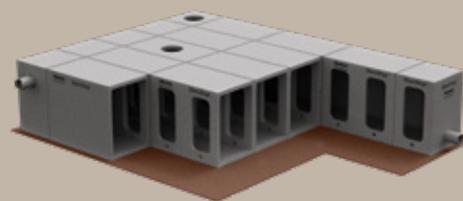
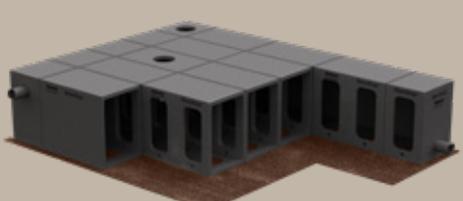


Table 2 – Foundation details

System type	Detention	Infiltration
		
Foundation	Compacted CBR-40 compacted road sub-base material	Compacted bedding Ø20 mm coarse aggregate
Dimensions	Foundation is 150 mm thick and extends 600 mm past the outer edge of the system.	Foundation is 150 mm thick and extends 600 mm past the outer edge of the system.

## 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 module.

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.

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 type and mass and each module will take 5-10 minutes to unload and set in place.

Lower pieces arrive on the truck with legs facing up. Upper pieces arrive on the truck with the legs facing down. There will be no need to invert the pieces on site.

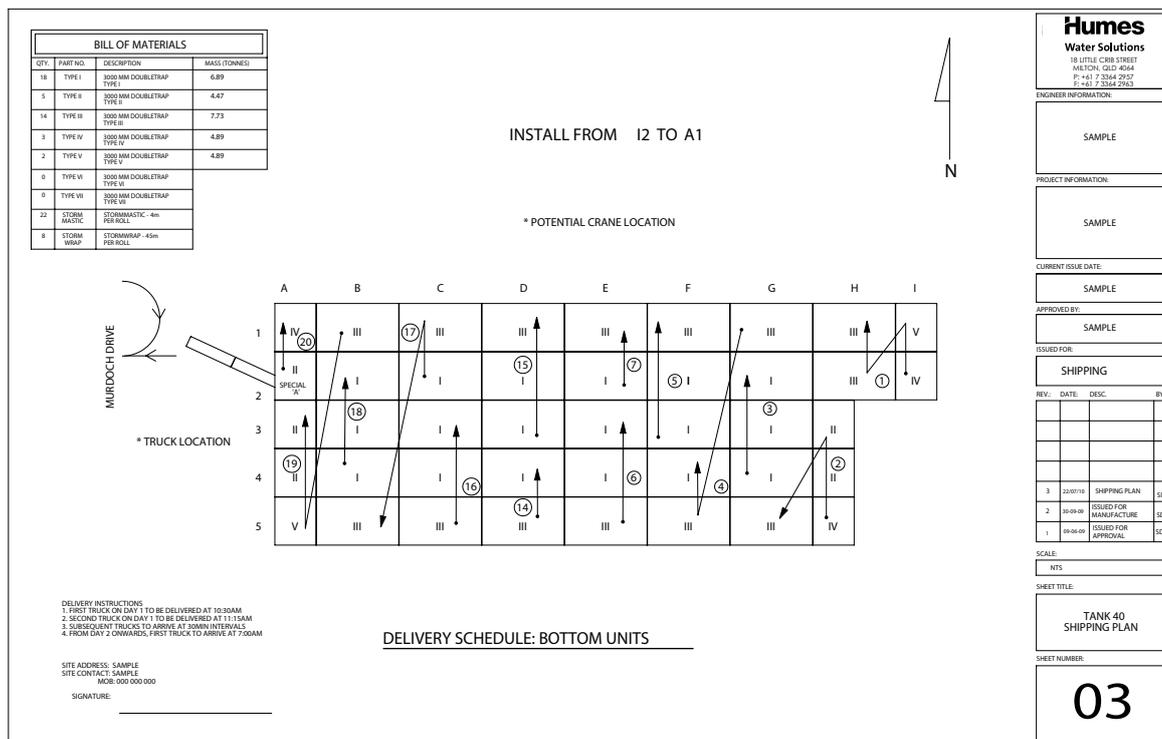
## Lifting

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

Middle:  
Step two

Bottom:  
Step three

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.

The StormTrap® system is typically installed as follows:

1. Check that the foundation has been prepared and compacted to the required dimensions and that the perimeter markings are clear.
2. Secure the first bottom piece for lifting with four Swiftlift® anchors. Take care not to strike the pieces together when unloading and lowering them. Be aware of pinch hazards at all times and don't walk or work under suspended loads.
3. When lowering the first bottom piece into position, pause 50 mm above the foundation then gradually lower it onto the foundation once it is aligned with the perimeter markings.



- It is essential to ensure all bottom pieces are level (check using a spirit level across the diagonals) and square with the perimeter markings before the anchors are removed. This will minimise any gaps when the top pieces are installed, forming the module.



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. It is very important to note that with a tall DoubleTrap™ system, a small gap between the modules at the bottom of the units can translate to a wide gap at the top. If this occurs, the modules must be removed and the bedding re-prepared such that the maximum gap at any point between any of the modules does not exceed 20 mm.



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



Top:  
Step seven

Middle:  
Step eight

Bottom:  
Step ten

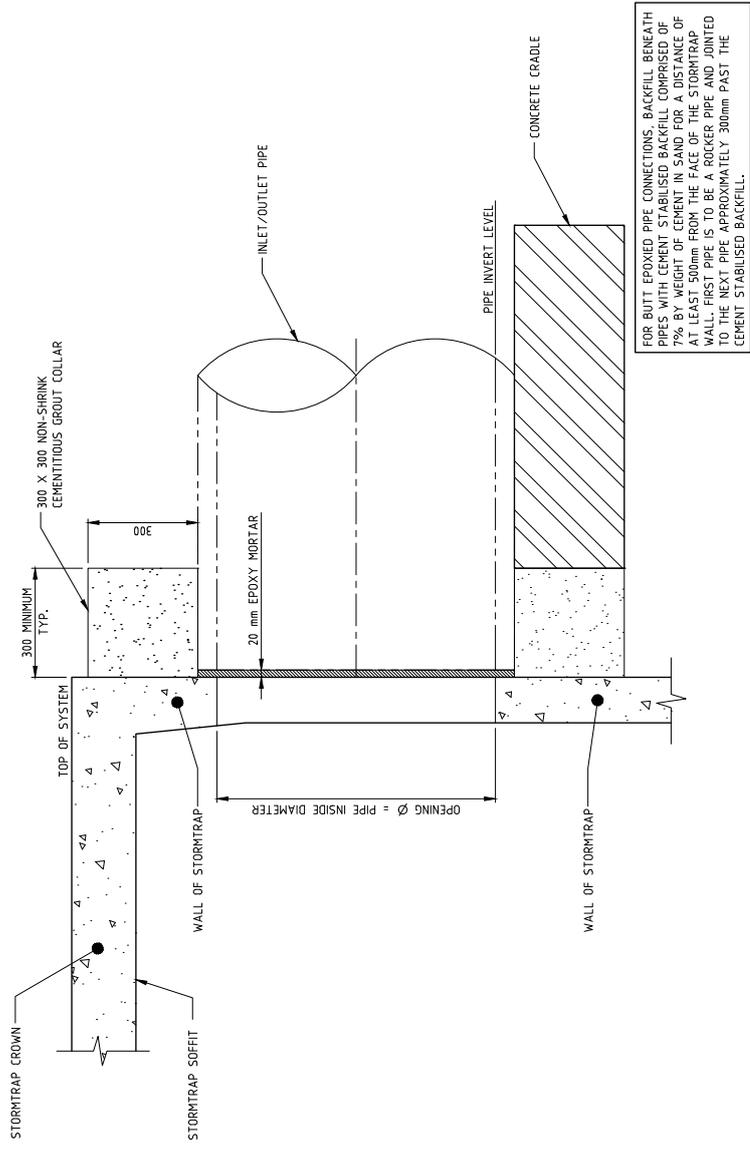
7. Commence lifting and installing the top pieces, row-by-row in the order shown on the shipping plan. The edge pieces (type II and III) and corner pieces (type IV and V) require a bead of mastic between the top and bottom pieces. Apply a 17 mm loop of mastic to the crevice in the feet of the bottom module (see inset image opposite).
8. 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 bedding and over the top of the modules and down to the bedding on the opposite side.
9. 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.
10. 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

<b>Humes</b> TECHNICAL SERVICES BRISBANE, QUEENSLAND		DRN. KRB [A-07-20] DRN. CDD. STK [A-07-20]	HUMES STANDARD DRAWINGS ENVIRONMENTAL PRODUCT STORMTRAP - HEAVYDUTY BUTT EPOXY PIPE
DRN. YML [A-07-20] CDD. KRB [A-07-20]	DRN. HJE [A-07-20]	DRN. HJE [A-07-20]	CONNECTION DETAILS
Holsim (Australia) Pty Ltd ABN 87 899 732 297 PRIVATE DESIGN. This drawing remains, at all times, the property of Holsim (Australia) Pty Ltd and is subject to intellectual property rights. No part of this drawing may be reproduced, or communicated in any form or by any means without permission of Holsim (Australia) Pty Ltd.		ISSUE <b>A2 EP-ST-PIPE-01 0</b>	ISSUE
2020		PLOT SCALE 1:1	DRN. NO.

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