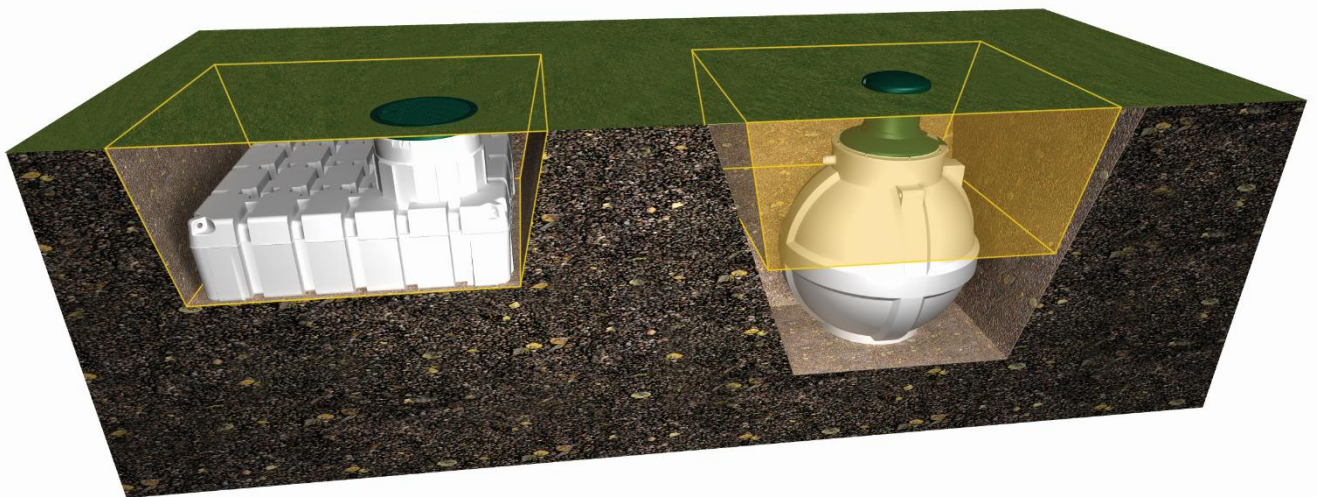


Harlequin® HydroStore

RAINWATER HARVESTING

General tank installation and operating manual



CONTENTS

Tank information	3
Product illustrations	4
Installation: Harlequin GAREN & DIRECT Hydrostore Tanks	6
Installation: Harlequin RWH-ST	7
Pump	8
Pump Trouble Shooting	9
Pipe connections	10
Maintenance	11



Health and safety

- The advice given in this booklet is provided with your safety in mind. We strongly advise reading the whole booklet before installing and using your Harlequin rainwater harvesting system.
- Installation of the equipment should only be undertaken by qualified personnel. These guidelines must be adhered to at all times. If the advice in this booklet is not followed, it will invalidate your warranty.
- All electrical work should be carried out by a qualified electrician.
- All plumbing work should be carried out by a qualified plumber.
- When covers are removed from underground tanks – during installation and maintenance - precautionary measures must be taken to ensure no-one can accidentally fall into the tank.
- All maintenance activities should include appropriate measures to isolate electrical and water sources before undertaking non-operational work with equipment.
- At all times, safe working practices should be observed and adopted to avoid accident and injury when working with the equipment.
- This document should be retained for future reference and remain in the household should a new occupier move in.
- This tank system is designed to collect and store rainwater. It should not be used for any other purpose without the prior agreement of Harlequin Tanks.

Tank information

Tank construction

Harlequin rainwater tanks are rotationally moulded in tough polyethylene which offers a very high level of impact resistance.

Tank design features

The tanks have Ø40mm moulded-in lifting eyes for use during handling and installation (only to be used when the tank is empty).

Drain invert depths are referenced in the drawing that is supplied with the tank. Also referenced on the drawing are options for altering the inverts.

The specified invert depth must not be exceeded without modifications to the installation. Failure to adhere to these design parameters will render any warranty null and void and may cause severe structural damage to the tank.

A secure pedestrian duty manhole cover is supplied as standard to comply with statutory regulations.

The tanks have a flat base for stability during transportation and storage prior to installation.

Storage

Tanks should be set on a smooth level base and securely tied or propped to prevent them from overturning and causing damage or injury.

Handling

The tanks should be handled by crane or other suitable equipment using the lifting eyes provided (lift only when empty). For confirmation of tank weights, please see supplied drawing.

Siting

The following points should be considered before installation of the equipment:

It is recommended to position the tank at a minimum distance from the face of the building using the '45° degree rule' to avoid affecting either the structural integrity of the building or the tank. In the event of uncertainty or if the ground conditions are unsuitable, it is recommended that the unit is a minimum distance of 5m from the face of the building. Plans should always be approved by the controlling authority and signed off by the building inspector after installation.

Consider placing inspection points in the feed line before the tank and at the overflow after the unit.

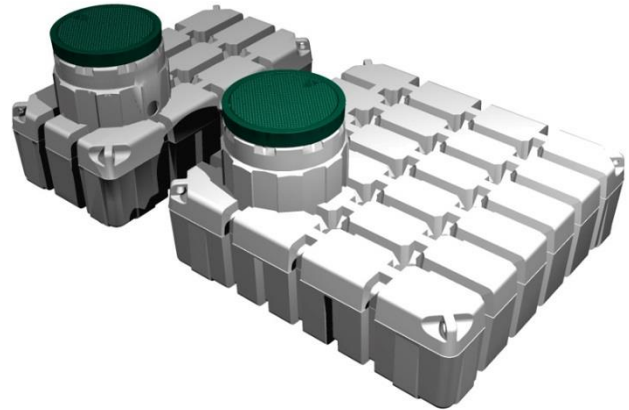


Figure 1: Harlequin Hydrostore (1500 & 2900) Tanks

Ensure that you purchase any required extension neck with the tank. Units installed with an inlet invert greater than 1000mm will require a reinforced civil design specific to the installation.

Adequate access to the unit must be provided for routine maintenance.

Superimposed loads

No superimposed loads, such as vehicles, should be allowed within 3m of any part of the tank. If a risk exists then the area of 3m around the tank should be fenced off.

If vehicular or other superimposed loads are required to come within the protected area of the tank a concrete surround or reinforced concrete slab, designed by a qualified civil/structural engineer, must be in place so that no loads are transmitted directly onto the tank.

The pedestrian duty lid cannot be used where vehicular traffic is likely to come within the protected area.

Water table considerations

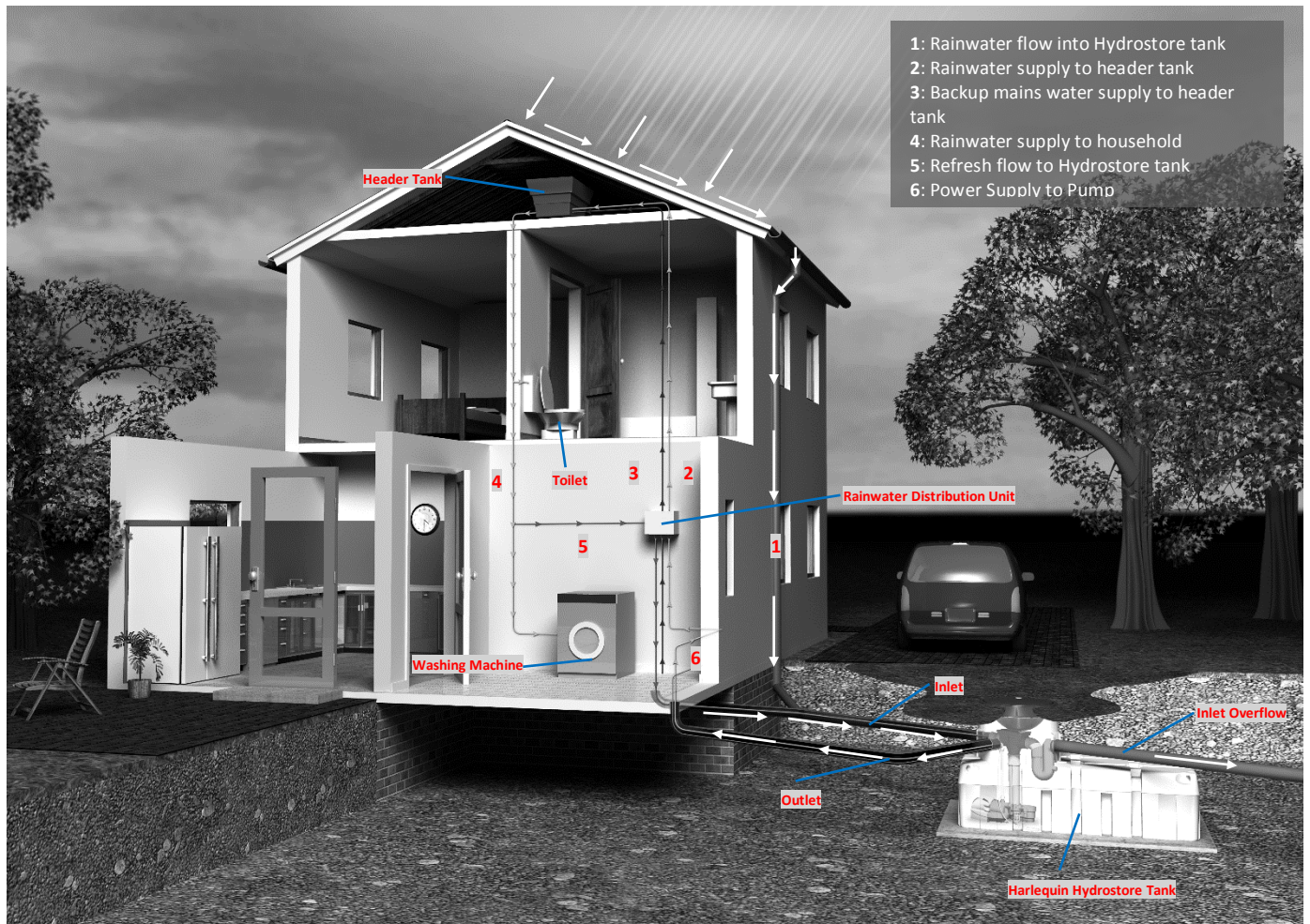
Even if no water table exists, if the complete surrounding soil structure is non porous, eg, clay, a danger exists of water pooling around the tank within the backfill. In this circumstance either a land drain should be installed to continually drain the installation or an alternate location selected.

HARLEQUIN RAINWATER HARVESTING INSTALLATION AND OPERATING INSTRUCTIONS

Figure 2:

Home Harvest Gravity

Rainwater is pumped to a header tank where gravity distributes it to the required water appliances. This minimises pump on/oN cycling, reducing electrical cost and wear on the pump. The system also ensures that the header tank is replenished with mains water once the stored rainwater is exhausted.



Installation images are for illustration purposes only

HARLEQUIN RAINWATER HARVESTING INSTALLATION AND OPERATING INSTRUCTIONS

Figure 3:

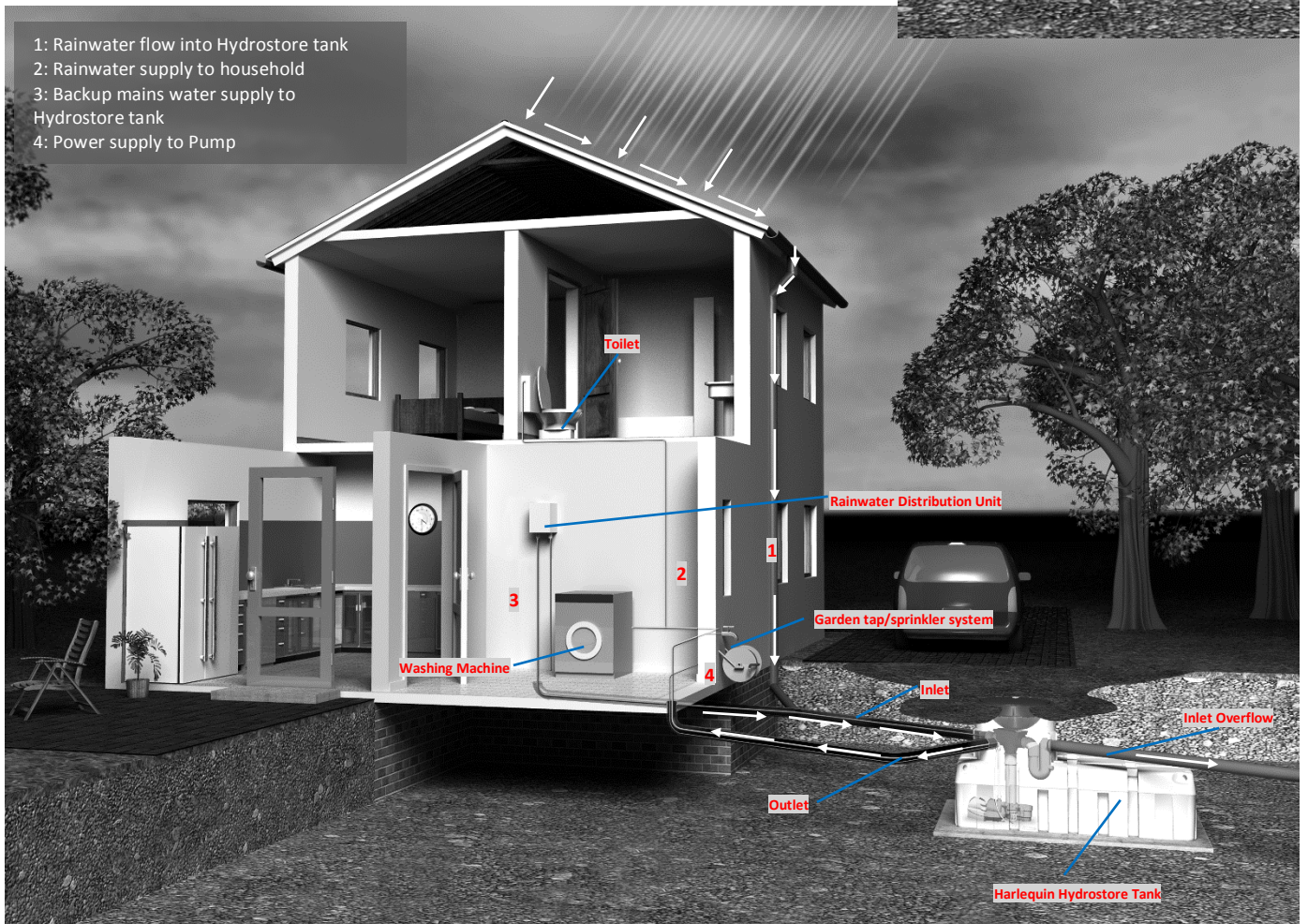
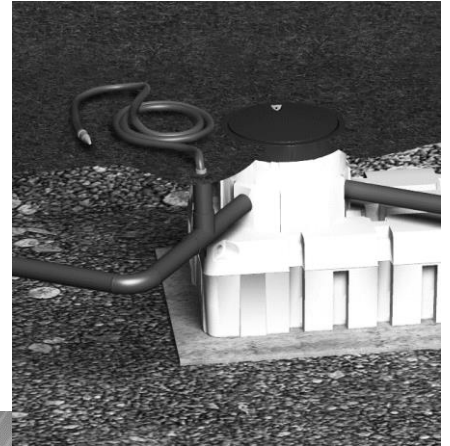
Home Harvest Direct

Rainwater is pumped directly to household water appliances. When supply of rainwater is exhausted, the 'Backup in a Box' unit uses mains water to replenish the tank. The pump in the tank is thus ensured of a constant supply of water to feed washing machines, toilets, garden taps, etc.

Figure 4:

Garden Harvest

A very simple system that allows the connection of a hose to the pump within the tank to provide water for irrigating lawns, gardens and car washing.



Installation images are for illustration purposes only

Installation: Harlequin HydroStore

It is recommended that a full risk assessment be completed for the site, installation process and on all parts prior to installation.

This product must be installed in accordance with the following instructions and the supplied drawings.

These tanks cannot be installed in conditions where the ground water may rise above the mid height of the tank body at any time. See supplied drawings for reference.

Pumps must be used to keep the excavation dry until the back fill has been completed.

Mechanical compaction machinery must not be used at any time in the installation process

Excavation should allow for a minimum thickness of 150mm pea gravel around the body of the tank(s) and 150mm thickness of pea gravel below the tank(s). Where difficult ground conditions are encountered, ie, in unstable ground or shrinking clay, an additional depth of 250mm should be excavated below the tank to allow for hard core and sand blinding to provide a firm base for the pea gravel foundation.

Pea gravel specification: Pea gravel or crushed aggregate of uniform particle size 12-15mm, free of sharp edges.

Chemically inert, washed clean and free of contaminants.

Place the pea gravel in the base of the excavation to a depth of 150mm, grade, level and compact.

The pea gravel must extend a minimum of 150mm beyond the footprint of the tank(s). This is vital to ensure a stable base to prevent settling of the tank(s) which could damage the pipe connections and that full support is provided by the backfill into the lower radius' of the tank(s).

Lower the tank(s) onto the pea gravel and check it is true and level using a spirit level. If the tank is not level build up additional pea gravel beneath the tank until a level base is achieved. Backfill around the tank in layers using pea gravel, ensuring that all of the lower radius' are fully supported.

Continue backfilling around the tank until the top of the tank body is reached. Next, fill each of the vertical support pillars across the top of the tank, building up in 100mm layers.

Ensure each 100mm layer of pea gravel is fully compacted using a manual tamper before placing the next layer.

Finally, continue backfilling over the tank with pea gravel.

Leave sufficient depth for top soil to finish off final ground level, this should be flush with the manway lid.



Figure 5: Harlequin HydroStore (1500) Tank

Connecting multiple tanks

All tanks are supplied with a 2" BSP female connection. This is moulded closed and water tight in the manufacturing process. Refer to the supplied drawings for location of the connection on the tank bodies.

If linking of tanks is required, this connection is required to be opened before installing the inter tank connections. To open the connections for both tanks:

- Insert a $\varnothing 55$ mm hole saw through the external side of the connection and drill out the inner plastic
- Remove the hole saw together with the cut plastic disc and any plastic flashing
- Insert a vacuum nozzle through the fitting (or from the turret) and suck out any plastic cuttings

To connect the tanks, it is recommended a 2" BSP male tank connector which will accept a semi-flexible $\varnothing 50$ mm polyethylene pipe is used.

The tanks should be positioned with a minimum of 500mm between their closest walls to ensure good access for installation of the backfill.

Failure to adhere strictly to these installation instructions will render any warranty null and void.

Installation: Harlequin RWH-ST

It is recommended that a full risk assessment be completed for the site, installation process and on all parts prior to installation.

These tanks cannot be installed in conditions where the ground water may rise above the base of the tank at any time.

Excavation should allow for a minimum of 200mm space all around the tank and 150mm below the tank.

When difficult ground conditions are encountered, ie, in unstable ground or shrinking clay, etc, it will also be necessary to allow for an additional depth (as much as deemed necessary by the supervising engineer) to be excavated to allow for hardcore and sand blinding to provide a firm base for the concrete bed.

Place wet concrete (slump test 30mm, strength 25N/mm) in base of excavation and grade and level to within 20mm.

Lower tank carefully onto concrete and check tank is true and level.

Fill tank with water to approximately 50% and place and consolidate additional concrete carefully under tank.

Thereafter haunch concrete up and around the bottom third of the circumference of the tank. Continue to fill the tank with water and carefully place concrete around the tank in 150mm thick layers, ensuring that there are no voids remaining around the tank, and that the level of water inside the tank is maintained at a level approximately 450mm higher than that of the concrete backfill.

Do not use a vibrating poker.

Continue to fill the tank with water until it reaches the height of the outlet pipe.

The neck extension can only be surrounded in concrete after the concrete around the tank has hardened (approx 24 hrs).

Failure to adhere strictly to these installation instructions will render any warranty null and void.



Figure 6: Harlequin RWH-ST Tank

Manhole cover

The pedestrian duty manhole cover is manufactured in tough, durable rotationally moulded polyethylene and fits directly onto the neck of the tank.

Low invert - tank neck cut down instructions (RWH-ST only)

The tank neck can be cut down to suit a lower invert depth.

Cut the neck using a jigsaw or a small hand saw at the cut line shown on the drawing supplied with the tank. You may need to trim the cut line on the lower part of the neck to allow the top part to slide down within it. Use 4x25mm wood screws on the inside to secure the two parts of the neck.

Pump Installation

Harlequin rainwater harvesting systems are available in three configurations:

Garden Harvest – no mains water filling method

Home Harvest Direct – with 'Back up in a Box'

Home Harvest Gravity – with 'Rain Director'

The installation manuals for the Home Harvest Direct and Home Harvest Gravity control systems are supplied with the respective products.

The pump is common to all three configurations and the following procedures should be used for all configurations.

Note: Dirt in tank: It is important to keep the tank clear of all contamination such as soil, grit or building rubble. Do not install or start the pump if the tank becomes contaminated, ensure the dirt is removed from the bottom of the tank with an alternate pump.

Prepare the pump

Remove the pump and all the components from the box.

Screw the cartridge filter (if purchased separately) onto the input end of the pump with its arrow pointing towards the pump. Screw the white plastic 1" strainer onto the input of this filter. Do not use PTFE tape on the input side of the pump to avoid shreds entering the pump.

This will invalidate the warranty.

Pump priming

It is essential that the pump is primed by removing the 0.5" black cap located on the top and pouring approximately five litres of water into the pump through a funnel. Note: even if submerged, the pump can burn out if not primed correctly.

Pump connections

The pump is designed to sit securely on the base of the tank in an upright position, with its nylon cord attached near the top of turret. Once the service duct is fitted, drill a small hole in the end of the pipe (internal side of the grommet) to secure the nylon cord. Measure out and cut a length of the supplied

25mm polyethylene delivery pipe (black, green stripe), equal to the depth from the top of the pump (when installed) to the height of the service duct. The length of pipe must ensure that it runs straight upwards without excessive sag. The pump has a 1" BSP fitting top outlet. The pipe connects to the top of the pump using the supplied compression fitting. This must be sealed with PTFE tape and tightened securely.

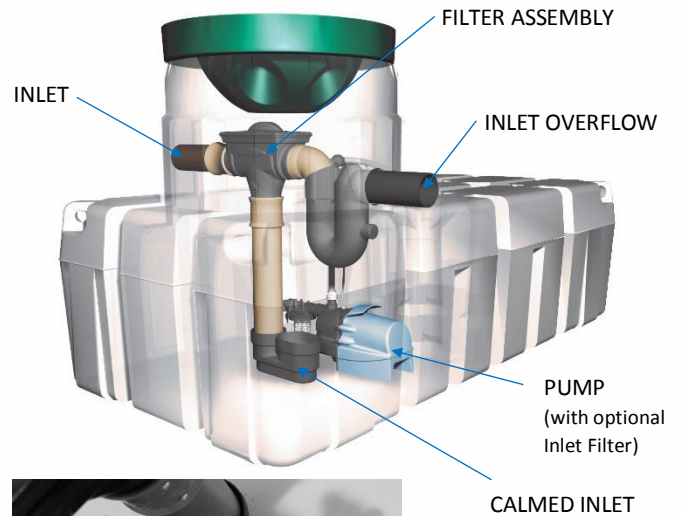


Figure 7: Pump components and installation

Connect the supplied right angled connector to the top of the vertical pipe. Attach the remaining length of hose to the right angled connector and feed it to the house through a Ø110mm service pipe. Use PTFE in all connections after the pump (but not before) to ensure a pressure tight system. Most water company inspectors now require rainwater pipe to be black with green stripes.

Ensure no pipes are exposed to the cold when ducted to and inside the building.

Lower the pump into the tank using the nylon rope positioning it in the upright position so that the discharge pipe is vertical. Secure the nylon rope inside the tank for future removal of the pump.

Pump electrical connection

The pump must be electrically connected by a qualified electrician and all outside electrical connections must comply with minimum IP ratings. The incoming power supply to the tank must be installed with a separate isolation switch and earth leakage circuit breaker in the source building. If the pump power cable needs to be extended it must be connected through a suitable IP rated junction box (not supplied) and mounted within the turret of the tank or appropriately located externally.

Pump trouble-shooting

Symptom	Probable cause	Solution
Reduced water flow	A: Suction pipe, inlet filter, delivery pipe or check valve obstructed B: Kink on a pipe connection C: Airlock within the pump	A: Remove obstructions B: Check all pipes to ensure straight running C: Re-prime the pump, submerge
The pump motor does not run	A: No electric power or incorrect wiring B: Pump has detected absence of water and has shut down. Pump might not have been properly primed C: Magneto-thermic switch tripped	A: Check the pump is connected to the power supply and rectify B: Reset the level of water in the tank, re-prime the pump, wait for reset and try again. See instructions on priming C: Reset the switch or wait for auto-reset, depending on model (see manual)
The motor runs but no water is supplied	A: Suction filter clogged B: Air inside the pump or filter body C: Pump not primed D No water in storage tank	A: Clean the filter B and C: Prime the pump, see instructions on priming. D: Pump should have shut down; possible faulty flow sensor
The pump hunts, ie, stops and starts intermittently	A: Small leak in pipe B: Non-return valve blocked C: Flow sensor stuck	A: Eliminate leaks B: Remove obstructions C: Unblock flow sensor through water outlet
The pump does not restart after the supply is re-opened	A: Pump has shut down due to lack of water. B: Pump has shut down due to tripping of the motor protection device C: Water head too high for the pump	A: Reset the level of water in the tank B: Check if delivery pipe is clogged, wait for the pump to cool down or reset and try again C: Reduce the height the pump needs to achieve

Pressure-sensitive pumps switch off when no water flow is detected at the inlet by the flow sensor. They switch on when a drop in pressure is detected at the outlet.

Before contacting Balmoral Tanks please run the following tests and prepare the following information:

1. *Confirm what type of pump you have or note its colour and features*
2. *Confirm that the pump had been primed before first use (see priming instructions above)*
3. *Ensure that the water in the storage tank is clean and that the cartridge filter (if purchased) on the input side of the pump is clean*
4. *If there is a garden tap, turn the pump switch on and open the tap. Check whether the tap flows readily and without hesitation. Leave the tap open with a hosepipe to a safe part of the garden for 15 minutes. Take note if the pump stops, and if so, after how many minutes*
5. *With the top of the underground tank open, close the tap. Count the seconds till the pump turns off; it should be between 10 and 20 seconds*

Pipe connections

Rainwater connections

It is vital for the self-cleaning function of the filter that water flows into and through the turret with a firm flow rate.

The last metre of rainwater pipe arriving to the tank should have a drop of 20-50mm (2-5%) to accelerate water flow, ie, twice the normal recommended fall of 1:40.

The first metre of rainwater pipe after the tank should have a drop of 20-50mm to encourage flow away from the filter.

Service duct

A duct is required to house the pump power cable, household water delivery pipe and the float switch cable (Back Up in a Box only). A $\varnothing 110\text{mm}$ grommet connection point is provided on the tank turret into which a $\varnothing 110\text{mm}$ connection may be made.

Overflow connection

The overflow from the tank is required to be directed to either a mains drain connection or a suitably designed soakaway (BS6297:2007), see further information below.

If connecting the overflow to a mains sewer, a non-return valve must be installed after the tank to prevent any backflow.

Soakaway requirements

If the overflow discharge is to a soakaway, a porosity test should be carried out as part of the assessment of suitability for sub-soil drainage. It must be capable of handling a high volume discharge equivalent to the maximum expected storm flow. This is important to prevent water from backing up into the tank.

Check with your building control officer for approval on maximum storm flow capability. Typically this value is 50% of the annual rainfall on the roof (considered as the largest possible storm in a 10 year period) in a 24hr period.

The position of the soakaway must be of sufficient distance (minimum 2m) from the tank to ensure that water is not able to permeate into the backfill around the tank. Care should be taken when installing the soakaway into non porous ground conditions such as clay soils. Under these conditions, water may not be able to freely disperse into the sub surface levels even if the soakaway has been correctly constructed.

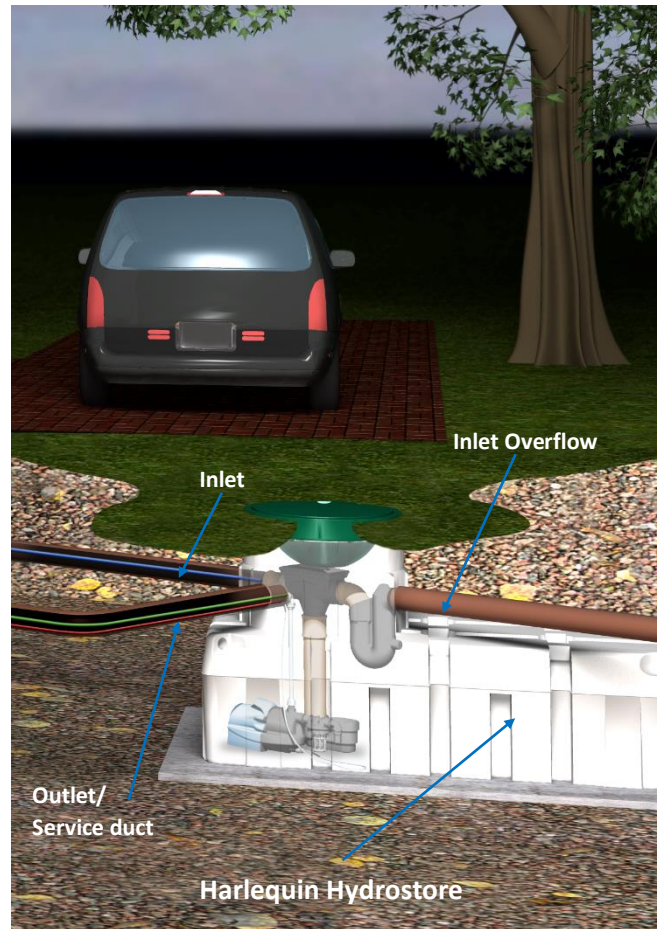


Figure 8: Pipe connections

Leaf prevention

In areas where the rainwater collection area is at risk of leaf exposure, eg, roof surrounded by high trees, it is recommended to install a leaf collection chamber. This protects the soakaway from becoming blocked leading to failure. Note: a leaf collection chamber is not required when the discharge is to mains drainage.

The chamber should be installed between the tank and the soakaway. The construction of the chamber should be a minimum of 1m³ capacity with a manhole access. The outlet of the chamber should be positioned near the top of the chamber and fitted internally with a vertical dip pipe running to the midpoint of the chamber. This ensures that floating or sunken leaves are captured in the chamber, allowing only the water to enter the downstream soakaway.

Maintenance

Filter cleaning

You should regularly check and clean the stainless steel filter.

Remove the manway cover to reach the filter.



Figure 9: Pump Filter

Do not lean into the tank to remove the filter.

In normal conditions the filter will require cleaning every two to three months but, initially after the first autumn, lift the lid off the inlet filter to check that leaves are not accumulating. If so, investigate the cause. Normally the flow of water pushes leaves and debris off the filter to the drain.

Read the note on soakaways above and ensure that any leaf trap is cleared at least annually to prevent excess build up.

It is very important to keep the filter clean. Failure to do so will result in a decrease in efficiency.

Pump

Check the (optional) pump inlet filter once a year and replace the cartridge every five years. Apart from this, the pump has no user serviceable parts and needs no other maintenance.

Tank

The tank is maintenance-free unless silt builds up. It is recommended to visually check silt levels every 6-12 months.

Any silt that has entered the tank from the building roof will sink to the bottom of the tank. This will not enter the pump provided it is not allowed to build up to a level higher than that of the pump inlet.

If the silt layer has built up over time or the installation reaches 10 years of operation removal of the silt must be performed.

Clear out the silt by lowering a solids handling pump to the bottom of the tank and pumping it out. Do not re-configure the supplied rainwater harvesting pump to perform this task as it is intended to pump clean water only.

Pump and suction hoses must be clean to avoid contamination.

Leaf collection chamber (if fitted)

Leaf build up should be removed from the chamber annually, following the autumn. If large build up is occurring, regularly filling the chamber, leaves should be removed more frequently. This is vital to protect the soakaway from blockage, leading to premature failure and back flooding of the tank.

HARLEQUIN RAINWATER HARVESTING INSTALLATION AND OPERATING INSTRUCTIONS

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