



Rainwater Harvesting for Commercial & Industrial Buildings

Contents



Quality Comes as Standard



Many of the components we use are supplied by WISY AG, a German manufacturer of specialist rainwater harvesting equipment. Established in 1989 the company quickly became the leading brand for their high quality Vortex filters, still the finest on the market at only 280µ. They are now sold globally through their world wide network of distributors and we are proud to be their UK agent and stockist.



HYDRAPRO Hydrapro® is brand of rainwater filters known as the FT range, for large scale commercial & industrial projects. Hydrapro® also produce a range of SMART controls panels with advanced features and connectivity options for situations where increased functionality is required. Hydrapro® products are manufactured in the UK by RHI Water Ltd.



Synergy rainwater tanks are our preferred choice for underground storage tanks. Their robust construction and attention to detail results in an excellent product that is fit for purpose. Being made to order gives great flexibility in size and configuration.



Dewey Waters are specialist suppliers of pre-insulated internal one-piece and sectional tanks, and again are made to order to suit customers requirements.

Introduction

Rainwater harvesting has become a commonplace feature of many modern commercial and industrial buildings, and is now widely regarded as a worthwhile contribution in reducing water demand in a wide variety of situations.

Many areas of the country have been experiencing seasonal water shortages, whilst flooding events are now all too familiar, sometimes even consecutively in the same location.

The capture and use of rainwater therefore makes good sense, both in terms of reduced demand for mains water and in contributing to stormwater attenuation. With the added benefit of lower water bills, there is a significant incentive to implement this technology.

The concept is very simple; water is diverted in to a storage tank via one or more filters in order to remove leaves and other large debris. This water is then pumped as required to the points of use, either directly, or via a break tank. The system will then automatically revert to using mains water in the event of the stored rainwater becoming depleted.

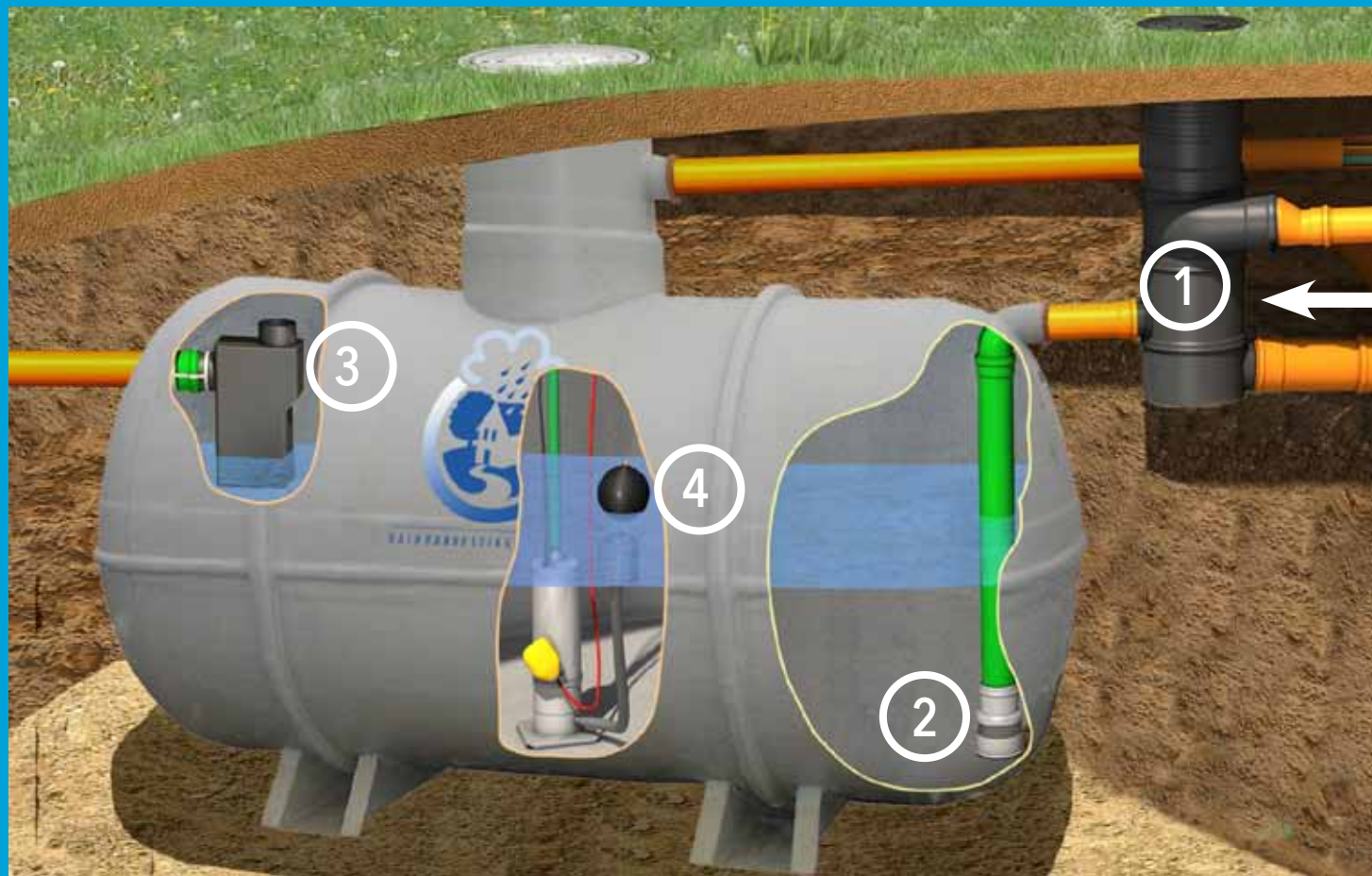


Needless to say, there are many ways to achieve this, and many different products available. There is a wide variety of tanks, filters, pumps and other specialist items on the market and these can vary greatly in quality and reliability.

The choice of components is therefore an important factor, along with selecting a reputable supplier with the requisite knowledge. We pride ourselves in our extensive knowledge and experience, together with use of high quality components and reputable supply partners. Our ability to tailor a solution to meet the clients' demands is a strength that sets us apart from the one-size-fits-all approach favoured by others.

4 Stage Cleaning Principle Ensures Clean Water

1. Primary filtration before water enters the storage tank. This ensures that only clean water reaches the tank, with all debris diverted to storm drain
2. Flow calming inlet pipe and diffuser prevents turbulence and re-suspension of sediments. Water in the tank remains clean
3. The surface layer of the water is regularly flushed into the 'multisiphon' overflow, thereby preventing the formation of a surface barrier layer and ensuring an optimum exchange of oxygen between air and water. The overflow incorporates a backflow prevention device and odour trap, and an optional vermin guard if required
4. Clear rainwater is extracted from the cleanest part of the tank, i.e. from around 15 cm below the water surface. The water is extracted through the floating suction filter.



Cutaway model showing the unique ability of the Vortex filter to oxygenate water. To watch a YouTube video of this in action:



System Types

A harvesting system can be designed in several different ways, though always with two common elements; filtration and storage. The design may be influenced by various factors, such as size and layout of building, ground conditions, available space etc.

Familiarity with components and a good understanding of the technology are important skills that enable good design, so that the right system is chosen for a particular application.

Our knowledge and experience can therefore be of great benefit and can help to avoid costly mistakes.

The majority of commercial systems fall in to three main categories;

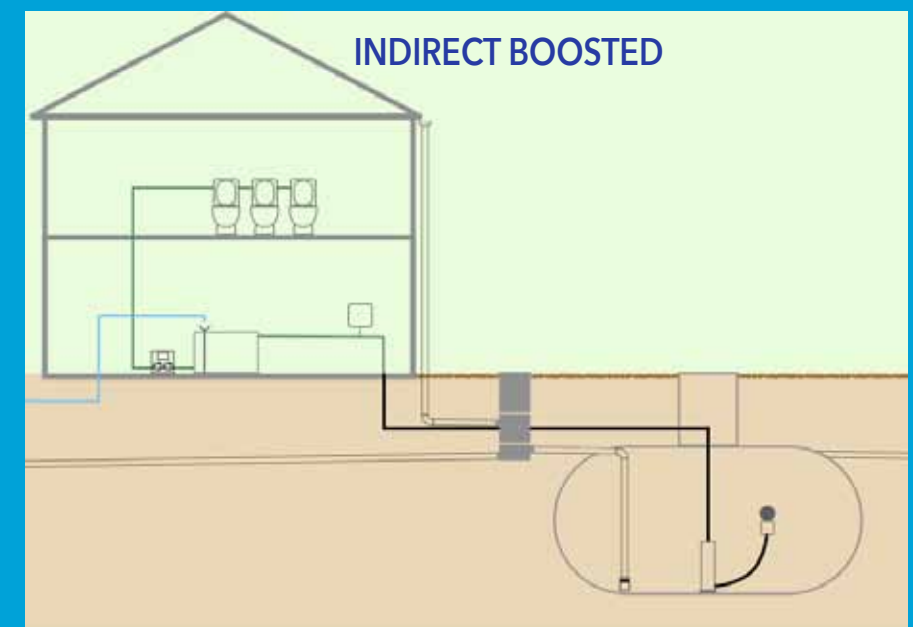
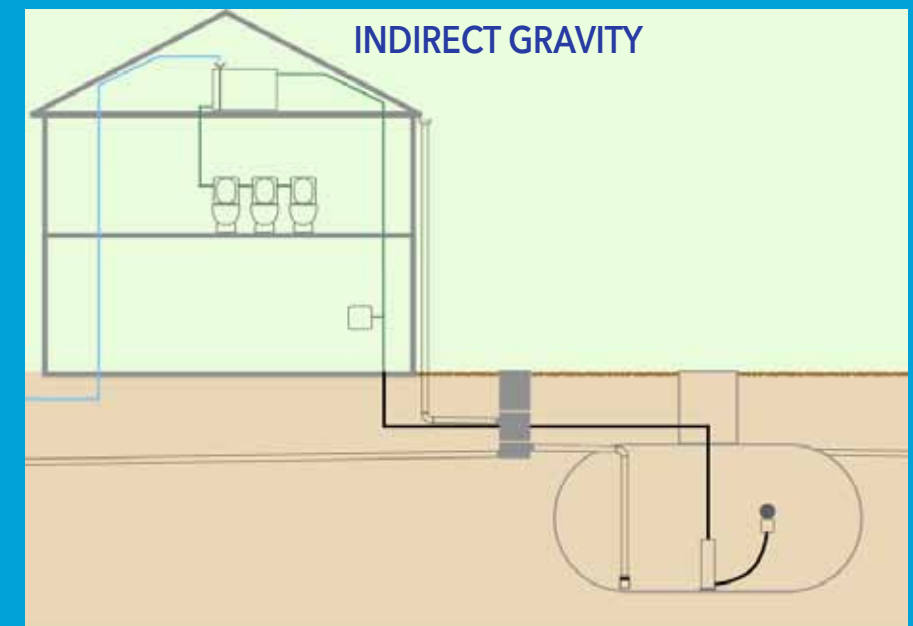
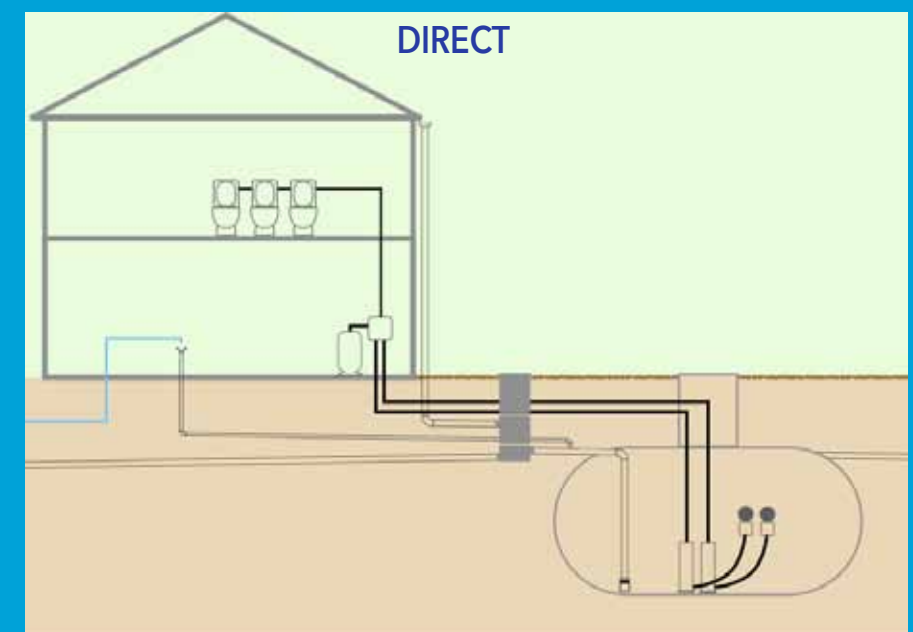
Direct system - storage tank with dual submersible pumps pumping water directly to WCs and other required outlets. Low level partial top-up to storage tank with mains water. If a pump fails, the second pump takes over and the system indicates the fault.

Indirect gravity system - storage tank with single submersible pump pumping water to high level break tank with mains water top-up. Gravity feed to WCs and outlets. If the pump fails, the system runs from mains water supply and the system indicates the fault.

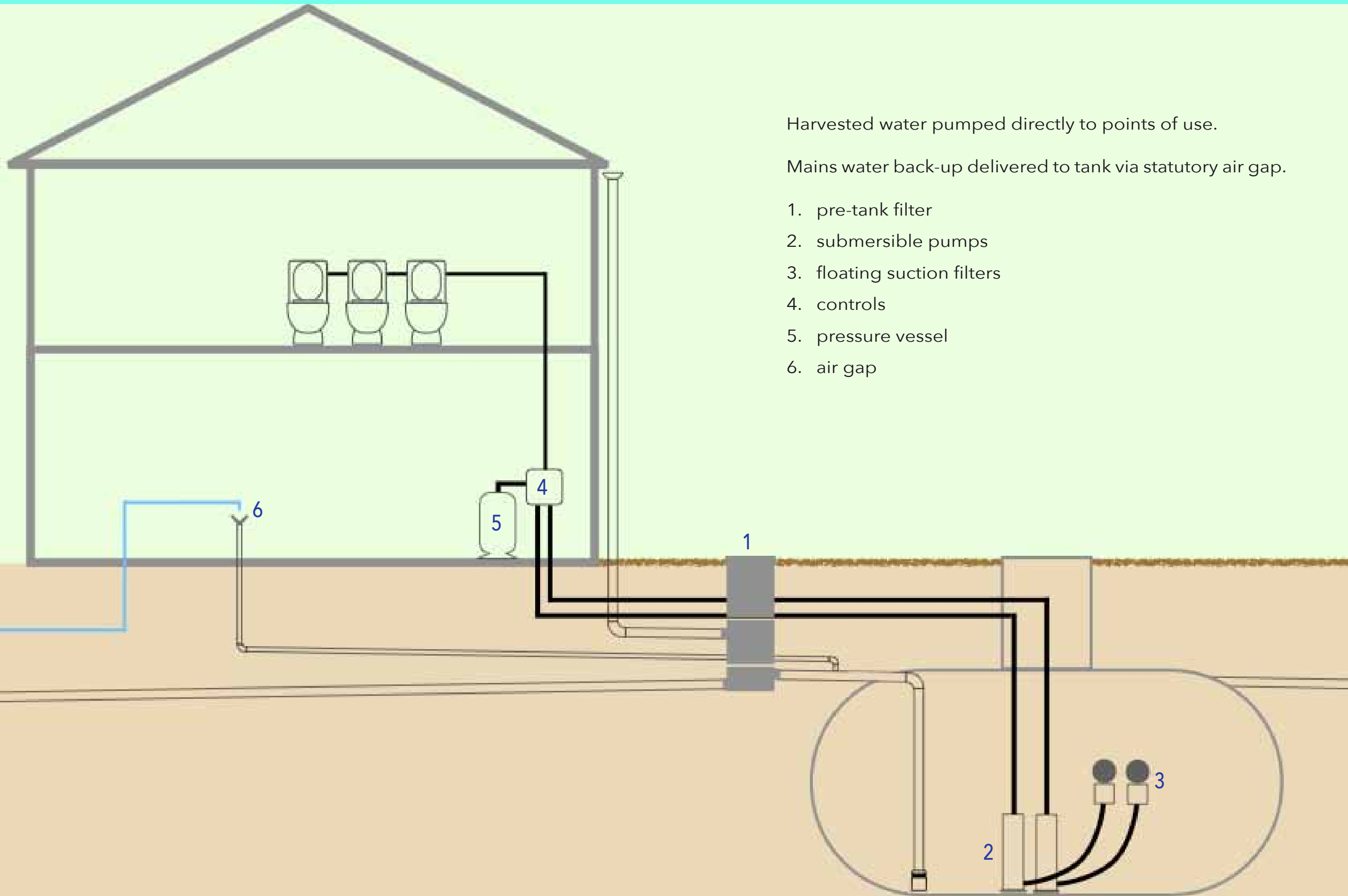
Indirect boosted system - storage tank with single submersible pump pumping water to break tank with mains water top-up. Booster set to provide pumped water to WCs etc. If the pump fails, the system runs from mains water supply and the system indicates the fault.

Indirect systems can of course be configured with dual pumps, but there is little benefit in this as the switch over to mains water is seamless and non-disruptive. This also adds unnecessary cost.

In addition, there are numerous **bespoke** options where the situation dictates a different solution, e.g. where a tank can be located below eaves level, but still high enough above the outlets it may be possible to have a gravity only system. Or sometimes there is a need to combine the rainwater with a water supply from another source such as a borehole or spring.



DUAL PUMP DIRECT SYSTEM - DUTY / STANDBY



Direct System with Duty / Standby Pumps

Our direct system is suitable for most applications where a pressurised supply is required. Rainwater is collected from the roof drainage system via one or more filter-collectors. The filtered water then flows into the storage tank. This ensures that only clean water ever enters the tank, so minimises the organic matter that can cause deterioration in water quality.

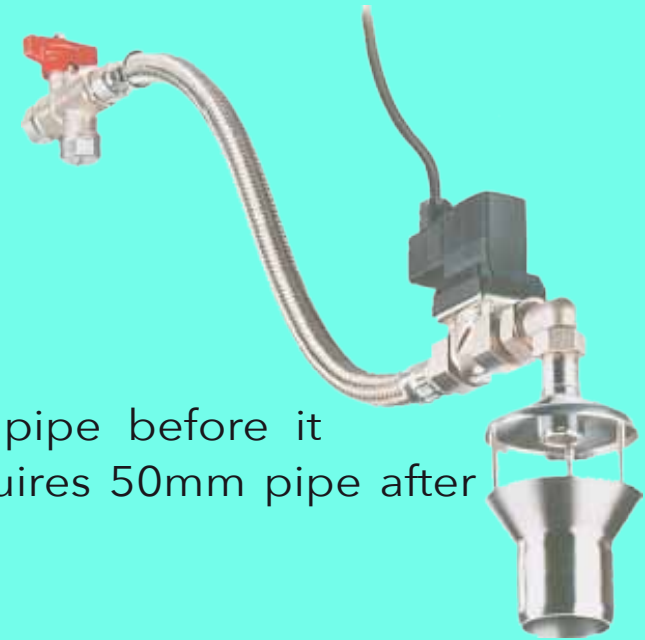
The harvested water is then simply pumped on demand directly to the required points. If the water level in the tank is too low, then mains water is fed to the tank as a low level 'top-up' in order to keep the system functioning. The bulk of the tank volume remains empty until replenished by the next rainfall event.

Because the water is pumped directly, it is generally desirable to use two pumps in a duty / standby format to provide continuity of supply in the event of one of the pumps failing. In this event, the second pump will take over and the system will provide an alarm to indicate the fault.

As the harvested rainwater is pumped directly to WCs, irrigation points or other outlets, it is necessary to provide a connection from the mains water supply to give a backup in the event of all rainwater being used. However, it is not possible to make this connection directly without breaching the UK Water Regulations. The mains water connection must therefore pass through a statutory air gap before it reaches the rainwater tank.



Once the water has gone through the air gap it is no longer under pressure and must flow to the tank by gravity. The pipe downstream of the air gap must therefore be laid to fall and must be significantly larger than the pipe before it (e.g. - 22mm mains feed requires 50mm pipe after the air gap).



Options & Additions

Filtration We offer a range of pre-tank and in-tank filters suitable for roof areas from 200 to 3000m². More than one filter can be used as required for increased capacity.

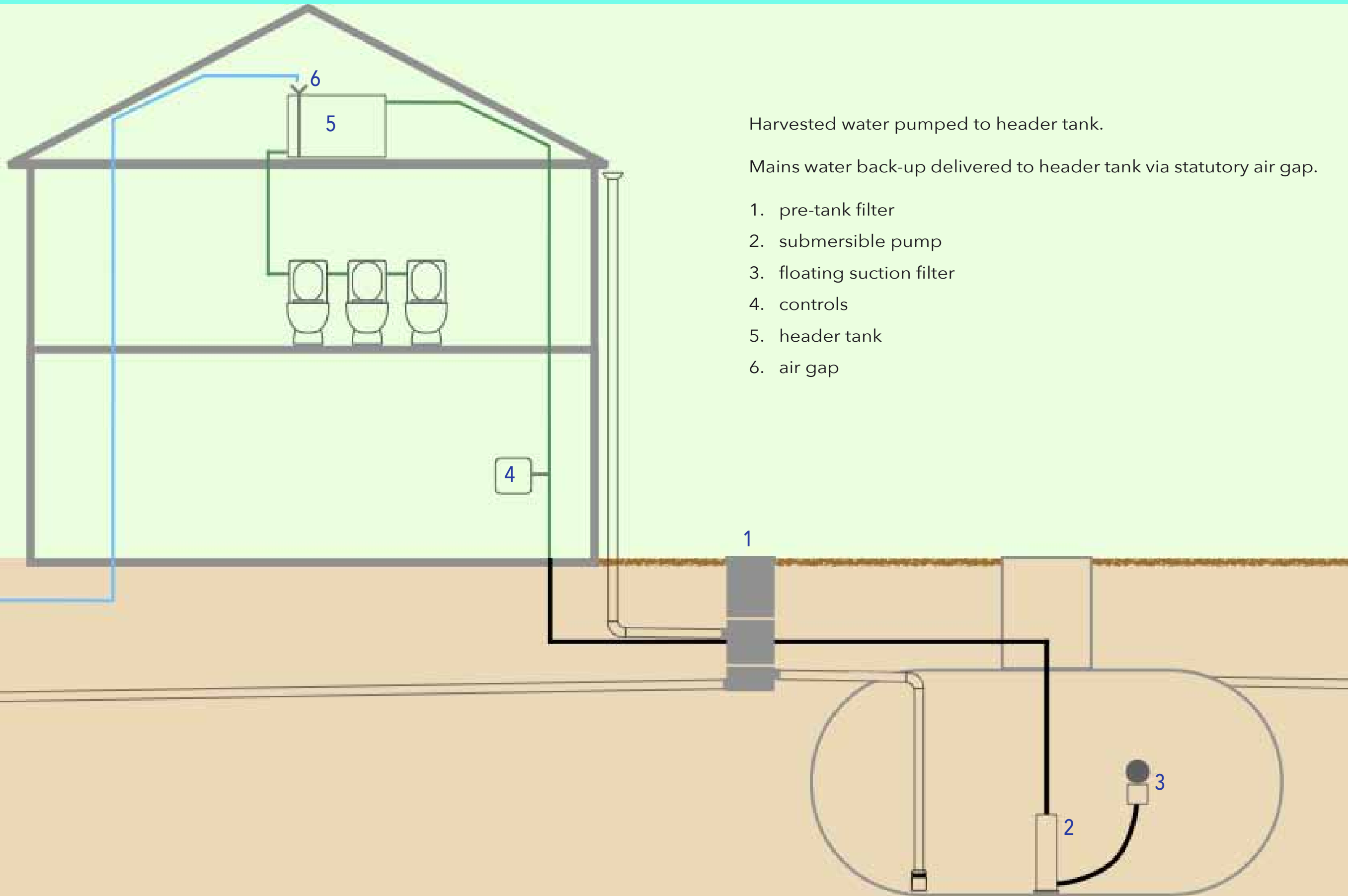
Storage Tanks We can supply underground tanks up to 100m³ capacity. Again, tanks can be linked together to provide a larger storage volume.

Pumps We can supply a range of submersible pumps to suit requirements. These can be either fixed or variable speed.

Water Treatment Where water is required to be of a higher standard we can supply UV disinfection to remove any potentially harmful organisms. UV treatment units are always supplied complete with fine sediment filtration down to 5 microns.

Monitoring We can also provide the means to monitor tank water level, water used volume, pump hours run and other parameters, for local or remote display or to link to BMS

INDIRECT GRAVITY SYSTEM - HEADER TANK



Indirect System with Header Tank

In situations where water pressure is less critical, and there is convenient space at suitable height, a simple header tank arrangement can be used. This eliminates the need for dual pumps in most cases, as if the submersible pump should fail, then the header tank continues to be fed by the mains supply whilst the system provides an alarm signal to indicate the fault.

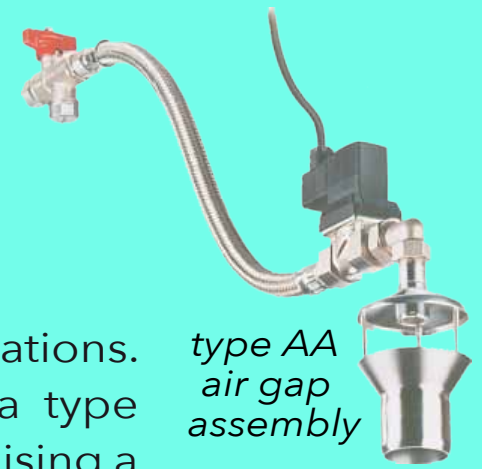
In this arrangement the harvested water is only pumped to the header tank when the water it contains drops to a certain level. The pump continues pumping until the header tank is full again. If there is insufficient water in the main storage tank, the level in the header tank continues to drop to the point where the mains water supply is activated. The header tank continues to run on mains water until rainwater becomes available again in the main storage tank.

The water from the header tank then gives a gravity supply to outlets at a lower level. Because the water is not pumped from this point, the resulting pressure will be dictated by the height difference between the header tank and the outlet being supplied. This is usually fine for use with WCs and other low pressure requirements, but where greater pressure is required then a booster set can be added to the design.

The main advantages to this gravity arrangement are lower energy use and a reserve of water available in the event of a power failure.



type AB air gap float valve



type AA air gap assembly

The mains water connection to the header tank is made via a statutory air gap in compliance with UK Water Regulations. This can be either a type 'AA' arrangement utilising a solenoid valve and tundish, or can be done with a special float valve fitted in a raised valve box to give a type AB air gap.

Options & Additions

Header Tanks We can supply 1-piece, 2-piece or sectional header tanks, as well as twin compartment tanks or systems with multiple header tanks.

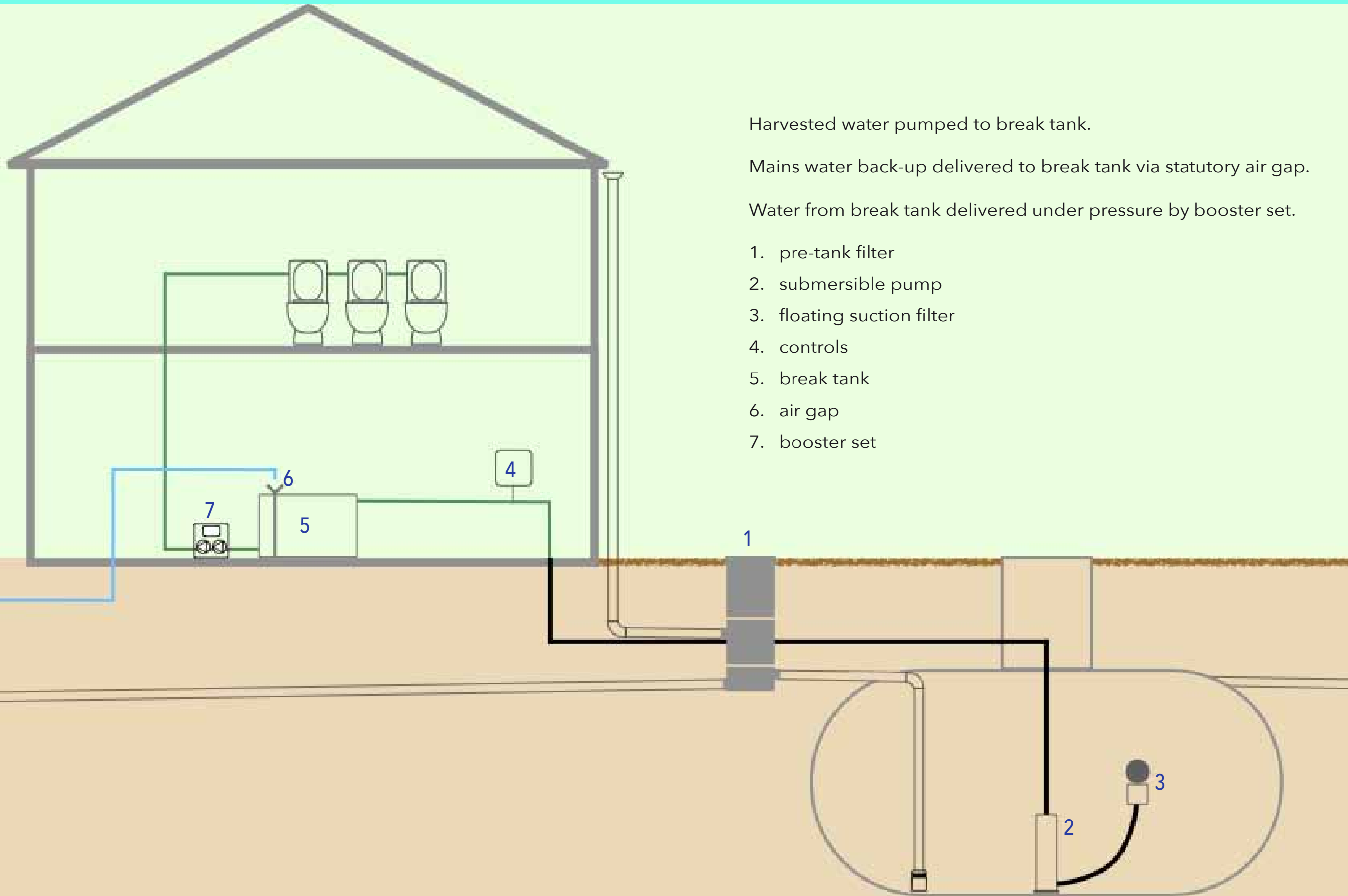
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INDIRECT BOOSTED SYSTEM - BREAK TANK



Indirect System with Break Tank & Booster Set

In some situations it is desirable to combine the benefits of a 'header' tank arrangement with those of a pumped supply. By adding booster pump(s) to the tank outlet the pressure can be higher and even set to particular requirements. As the supply from the break tank does not rely upon gravity, it does not need to be positioned at high level. This means that the tank can be located within a ground floor plant room or any other suitable location.

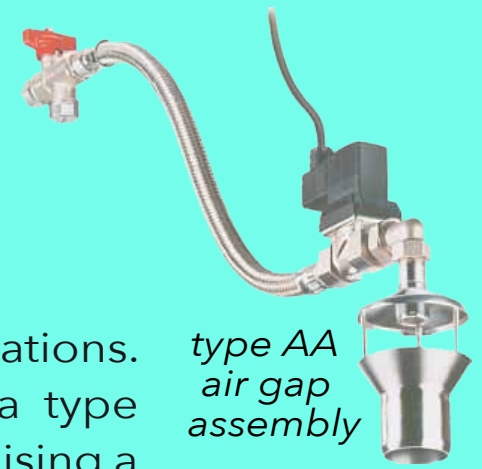
In this arrangement the harvested water is only pumped to the break tank when the water it contains drops to a certain level. The pump continues pumping until the break tank is full again. If there is insufficient water in the main storage tank, the level in the break tank continues to drop to the point where the mains water supply is activated. The break tank continues to run on mains water until rainwater becomes available again in the main storage tank.

The water from the break tank is then pumped on demand to WCs, irrigation points or other outlets. Because the water is not pumped from this point, The booster set usually has two or more pumps to provide duty / standby capability and can be selected to suit the requirements of the outlets being served.

Booster set pumps can be fixed or variable speed.



*type AB air
gap float
valve*



*type AA
air gap
assembly*

The mains water connection to the break tank is made via a statutory air gap in compliance with UK Water Regulations. This can be either a type 'AA' arrangement utilising a solenoid valve and tundish, or can be done with a special float valve fitted in a raised valve box to give a type AB air gap.

Options & Additions

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Filtration We offer a range of pre-tank and in-tank filters suitable for roof areas from 200 to 3000m². More than one filter can be used as required for increased capacity.

Storage Tanks We can supply underground tanks up to 100m³ capacity. Again, tanks can be linked together to provide a larger storage volume.

Water Treatment Where water is required to be of a higher standard we can supply UV disinfection to remove any potentially harmful organisms. UV treatment units are always supplied complete with fine sediment filtration down to 5 microns.

Monitoring We can also provide the means to monitor tank water level, water used volume, pump hours run and other parameters, for local or remote display or to link to BMS

Other Types of System

The previous examples illustrate the most common designs which suit the vast majority of projects. However there are occasions where none of these offer quite the right solution.

We have an extensive range of components available, which gives us the flexibility to adapt our systems to a wide variety of situations.



Where site conditions permit, it is usually preferable to install storage tanks below ground.

However, in some situations this may not be possible in which case an above ground tank could be the solution, whether outside or inside the building, one-piece or sectional.

Sectional tanks provide an almost unlimited variety of sizes and configurations. Our many years of experience have taught us that there are very few new build projects where a solution cannot be found. It's just about knowing what works best in any given situation.



When plant room space is limited, we can offer units with a minimum footprint, or in extreme cases an external weather and frost-proof enclosure can eliminate the need for internal equipment all together.



Occasionally it may even be possible to site the storage tank at high level within the building, providing it is below the gutter level. This may permit a gravity system to be utilised, negating the need for pumps, giving a simple but effective design at very low cost.

Many other options are available as alternatives or 'add-ons' to any of our standard designs, and we pride ourselves with our ability to provide a solution tailored to customers requirements.

Filtration

Pre-tank filtration is arguably the most important part of any rainwater harvesting system. By preventing leaves, insects and other organic matter from entering the storage vessel, the water is able to be stored over a long period without serious degradation in quality. This is further enhanced where oxygen is introduced in the process.

Generally speaking, the finer the filter, the better it will be at performing its task. However, if it is too fine then it will not collect water under gravity conditions.

German specialists Wisy® AG have pioneered rainwater filter technology resulting in the unique Vortex filter. These have a stainless steel element of 280µ or 380µ mesh which was found to be the optimum grade for maximum efficiency. The vertical surface prevents debris from accumulating on the filter surface, and is simply washed away to drain.

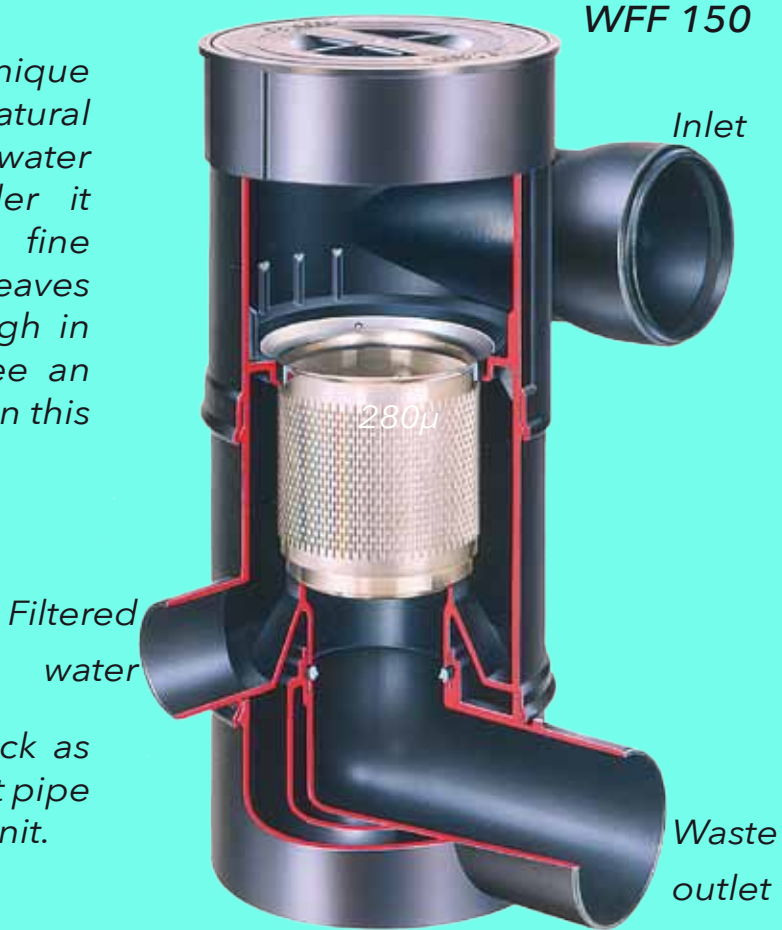
We consider these to be the best rainwater filters by far, having supplied thousands of them since the 1990's. Three versions are available for 100mm, 150mm or 300mm pipe, suitable for c.200m², c.500m² or c.3000m² roof area respectively. All Wisy® Vortex filters are fully self-contained and self-supporting so do not need to be installed within a separate chamber as with some models. All are suitable for trafficked areas; the two smaller versions being rated for 30t GVW, whilst the 300 model is available up to 60t GVW.

All Wisy® filters come with a 5-year warranty.

	Inlet	Filtered outlet	Waste outlet	Filter grade	GVW rating
WFF100	100mm	100mm	100mm	280µ	30t
WFF150	150mm	100mm	150mm	280µ	30t
WFF300	300mm	200mm	300mm	380µ	60t



Wisy® Vortex filters have a unique design that exploits the natural adhesion property of water. As water flows over the vertical cylinder it is drawn laterally through the fine stainless steel mesh, leaving leaves and other debris to drop through in to the lower outlet. You can see an animation of this effect in action in this YouTube video:



The vertical cylinder cannot block as the open cross-section of the inlet pipe is maintained right through the unit.

HYDRAPRO® Filters

Another option, particularly for situations where only a shallow invert drop can be accommodated, is the HYDRAPRO® FT range from RHI Water. Constructed entirely of AISI 304 stainless steel these filters have a 750μ horizontal filter screen, with the difference in level between inlet and waste outlet being only 80mm. They also have a unique backwash function for effective self-cleaning. The cleaning function can be manually



View inside from above showing filter screen and backwash device

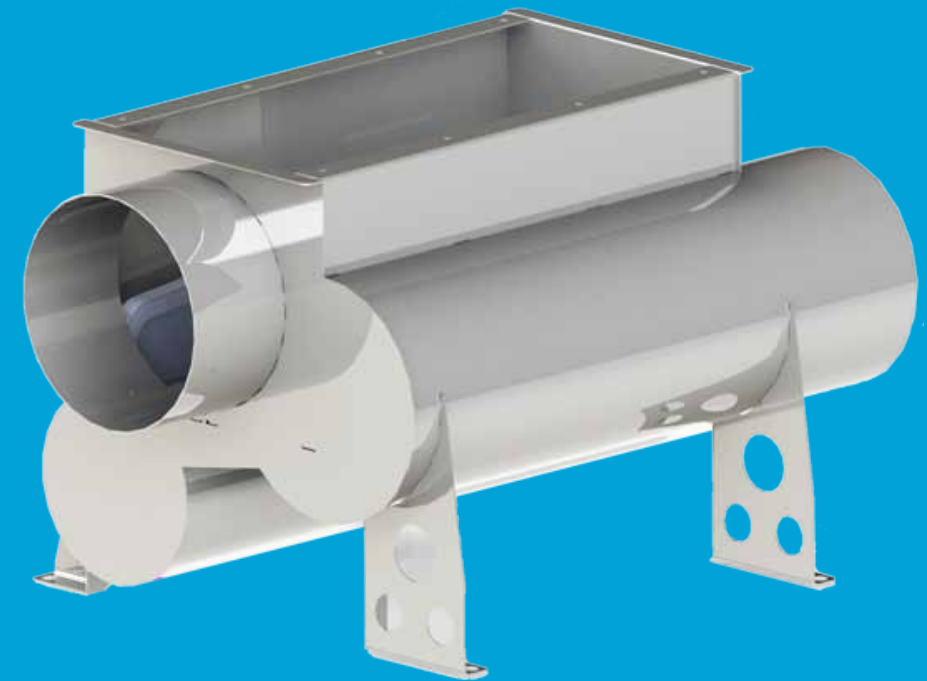
activated simply by opening a service valve or can easily be automated with the addition of a solenoid valve and time switch. HYDRAPRO® control panels have this facility built in.

Designed for use both below and above ground, HYDRAPRO® filters are extremely versatile, and can be fitted within or on top of a tank, or installed within a chamber or mounted on suitable framework. For use within a building they can be supplied with flanged connections and/or sealed cover if required.



Several models are available to suit 200mm, 250mm, 300mm and 450mm pipe. Other sizes can be manufactured on request.

For YouTube video of HYDRAPRO® filter click [here](#):



Waste water outlet / overflow

Filtered water outlet



Waste water outlet / overflow

Filtered water outlet

Inlet

Connection for filter back-wash

Rainwater Tanks

We can supply underground rainwater tanks in a wide range of sizes from 1,000 to 100,000 litres capacity, delivered direct to site. Our tanks are manufactured to BS4994 from robust GRP and are pre-fitted with calmed inlet and a trapped overflow unit with backflow prevention, as required by BS EN 16941-1:2018. Tanks can be configured to suit your requirements.

If required tanks of 10,000 litres and larger can be supplied with a HYDRAPRO® FT filter unit pre-installed within a separate turret. The turret is also fitted with a ladder to facilitate safe access for maintenance.



We can also supply above ground tanks, either one-piece or sectional, as well break tanks for use within a building e.g. plant room (see following page for more details)



Sectional Tanks

In some situations it is preferable to have the main water storage within a building rather than buried in the ground. For smaller tanks where access is unrestricted, a one-piece tank is the best option. However, for tanks larger than 12,000 litres nominal capacity, or that need to be installed beyond a restricted access, a sectional tank is the solution. They can of course, also be installed externally if desired.



These modular tanks are made up of hot-pressed GRP insulated panels, generally of 1000mm or 500mm dimensions. This allows great flexibility in size and shape so a tank can easily be designed to fit most spaces. The panels are bolted together through their flanges. If required the flanges can be internal to permit the tank to make maximum use of available space.

All tanks are supplied insulated c/w top access hatch, vent, screened overflow and warning pipe, and in addition can be supplied with a variety of features;

- standard, drop-arm or Keraflo inlet valve
- valve box for Category 5 protection
- calmed inlet
- internal divider
- internal or external access ladder
- safety railing
- side access hatch
- reinforced base
- drip tray



Sectional GRP tank 2.5m high x 5m x 13m Externally flanged

Photographs courtesy of Dewey Waters Ltd.



*2m high internally flanged tank.
All bolts are internal so tank can be positioned tight to wall.*

Break Tanks

Our range of one-piece GRP break tanks are available in a variety of sizes ranging from 420 litres up to 12,000 litres nominal volume. All tanks are manufactured under ISO 9001:2008 quality standard and are WRAS approved. They can be supplied either insulated or uninsulated. Pre-insulated tanks can have either 25mm, 38mm, 50mm or 75mm CFC & HCFC-free insulation.

Tanks are equipped with a Category 5 air gap of either type AA or type AB design and can be supplied in several different formats as required:

- Standard one-piece
- Horizontal split (2-piece) where access does not permit standard design
- Sectional where access is very restricted -e.g. standard doorway



Rainwater break tank with type AA air gap.

The mains water supply is fed through a solenoid valve and tundish. This arrangement gives the type AA air gap to provide Category 5 backflow protection as required by the Water Regulations. The solenoid valve is controlled by a float switch within the tank. A second float switch controls the pumped rainwater feed.



Rainwater break tank with type AB air gap.

The raised valve box houses an inlet valve for the mains water supply. The inlet is thus held above the water level, and the valve box incorporates a type AB air gap for the backflow protection, as required by the Water Regulations. The rainwater supply to the tank is controlled by a float switch within.

The raised valve box creates the AB air gap via a slotted weir overflow. The overflow is screened and is compliant with the UK Water Regulations.

All such tanks are WRAS Approved.



Pumps & Booster Sets

Submersible Pumps

Underground tanks are usually equipped with submersible pumps due to their performance and efficiency. This is especially important where the tank is some distance from the plant room, which might prohibit the use of surface pumps.

Generally we supply multi-stage pressure pumps with a threaded suction inlet in order that a suction filter can be attached. This prevents any fine debris from entering the pump impellers and is an important aspect of the system design. Pumps can be single or three phase and fixed or variable speed.

Surface Pumps

In some situations it may be preferable to use suction pump that is remote from the tank. For example, where an above ground tank is used and its location would make a submersible pump susceptible to damage from freezing. In this situation the pump(s) can be located within the building or housed in an insulated kiosk. A wide range of suction pumps is available, depending on the specific requirements of the system.



Submersible pump with suction filter



Booster Sets

Booster pumps are generally supplied in sets of two or more, mounted on a common frame with suction and discharge manifolds.

Booster sets are usually configured to operate as duty/standby or duty/assist / standby units, depending on requirements. Pumps can be either fixed speed or variable speed.



We offer a wide range of units from reputable manufacturers such as Wilo, DAB, Calpeda and Lowara.

Sets are built to order to suit customers specification & supplied complete with all necessary controls and connections.



System Controls

We supply a range of pump controllers and control panels suitable for single or dual fixed speed pumps, and inverter drives for variable speed units.



The Zeta 02 pump controller from Wisy® possess a significant advantage over similar devices. It has a unique ultra-low energy power consumption of only 0.2 watt. Since the pump is mostly in standby mode, this saves considerable energy compared to other models which typically consume up to 50 times as much.

We offer several in-line VFD (variable frequency drive) controllers. Water cooled and simple to set up.



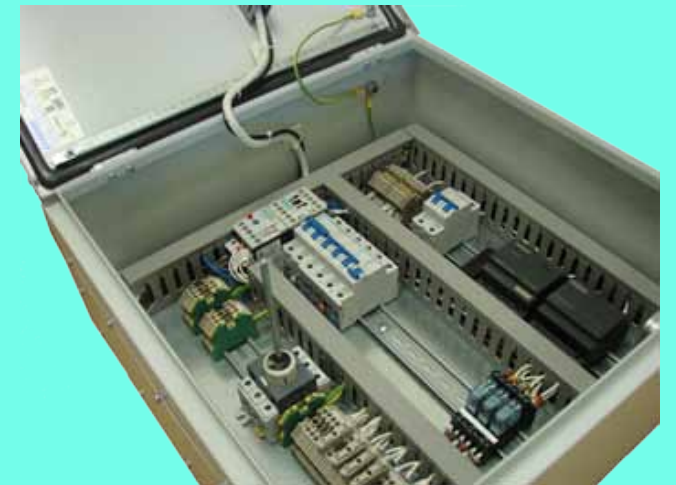
For larger pumps and multiple pump systems the E-Drive VFD can connect to almost any pump on the market. It can maintain constant pressure, flow, or even temperature and has a Serial RS485 output.

The E-Box control panel is a versatile unit that can be used for single or dual pumps, either 1-phase, 3 phase 230v or 3 phase 400v. Current can be adjusted from 1 to 12 amps for motors up to 5.5kW



The HYDRAPRO® Smart CPU control panel offers total system control, giving the convenience of operating pumps, solenoid valves, booster set, UV unit and more, all from one central panel. Seven models are available for single or multiple pumps, either fixed speed, soft-start or variable speed, with bespoke options available.

HYDRAPRO® logic controlled units can also monitor the system and provide remote data displaying if required. Easy to set-up, fully programmable and with full BMS integration. Simple to use with illuminated screen and eight programmable buttons; more advanced models include a touch screen interface, and the option of remote access via web browser.



- CE Marked control panels
- 7 models available
- User-friendly interface with a choice of LCD or Touch-screen display
- MCB protection on electrical features
- High feature content. Visible alarms on both display and system status
- Upgrade friendly: Upgrade your existing features at any time
- Connectability: Interface with a Building Management System (BMS) using volt-free contacts, ModBus Or Profibus
- Utilise the water usage data to provide an educational or monitoring display



UV Water Disinfection

The *Saphir* UV range comprises a number of compact, economical UV units designed with the consumer in mind. The *Saphir* System utilises commonplace single ended low pressure UV lamp technology, thus making the system not only economical for energy running costs, but also for replacement UV lamps. The single ended UV lamp also makes servicing the equipment very simple. *Saphir* units for domestic and light commercial installations are available in 6 models suitable for flow rates up to 160 l/min. (9.6m³/hr)



UV Pre-filtration

In order for UV light treatment to be effective the water passing through the unit must be clean and free from all but the most minute particles. Generally this means filtering the water down to 5 microns before it enters the UV chamber. This is done using either replaceable wound cartridges or bags.



Additional treatment can also be combined at this point in the system e.g. carbon filtration.



Where larger flow rates are required, we offer the 5 Series and 6 Series models suitable for flow rates up to 23m³/hr. These are multiple lamp units with additional telemetry options suitable for commercial and industrial applications, particularly where advanced features are required.

STANDARD FEATURES:

- IP 65 control cabinet
- PLC Controller
- Lamp on/fail notifications
- Hours run meter

ADVANCED OPTIONS:

- UV Intensity monitoring
- Remote Start/Stop
- System Healthy
- Stop Flow Fault Condition
- Remote UV Level Display
- GSM text message System
- Duty / Standby System control
- Remote screen
- LAN connection

Commissioning

We offer a full commissioning service by our trained engineers.



The installation of a rainwater harvesting system typically cuts across several disciplines. Installation of underground storage tanks and filter units are generally done as part of the groundworks.

Fitting of control panels, internal tanks and booster sets etc. will involve both mechanical and electrical skills so are usually undertaken by the M&E contractors.

Once all installation work is complete and connections to power and water have been made, the system is ready for commissioning.

Following approval of RAMS and satisfactory completion of the relevant checklist, we will arrange a visit to site by an engineer who will then thoroughly check and test the entire installation.



The system can then be signed off and put to use if all is satisfactory. Any faults or causes for concern will be highlighted in a written report.



Our full commissioning procedure covers all components of the system supplied by ourselves, but does not include entry into tanks.

The process can normally be accomplished in one day and we aim to carry out the work within two weeks of request.



Maintenance



We offer a full maintenance service for any of our own systems, as well as other manufacturers' systems where possible.

With over twenty years of experience behind us, our skilled engineers provide an efficient and competent service at a competitive price.

We recommend our RainCare® annual service for all our systems and wherever possible we will contact the owner when this is due. Maintenance visits can usually be arranged within 2-3 weeks of request.

Our service includes a comprehensive check of the entire system and the remedy of any faults:

- Cleaning of pre-tank filters
- Cleaning of pump suction filters
- Check & test operation of pumps
- Check & test operation of float switches and sensors
- Check & test operation of all valves, both manual and electrical
- Check & test operation of control unit
- Replacement of UV lamps
- Replacement of UV quartz sleeve if required
- Replacement of wound cartridge or bag filters
- Replacement of any faulty or damaged parts
- Check system for any leaks or signs of wear



Our engineers are fully equipped and carry a wide range of spares and accessories. Wherever possible, repairs will be effected on site. However on the rare occasion that an immediate fix is not possible then components may be brought back to be repaired in our workshop.

Tank Cleaning and Repair

It is sometimes necessary for rainwater storage tank to be cleaned after a number of years or if the tank has suffered severe contamination. There are even occasions when a GRP tank suffers damage, usually during the installation process.



We are commercial partners with specialist companies who carry out GRP repairs and a full tank cleaning operation.

This allows us to provide a comprehensive range of services to our customers, giving peace of mind and confidence in our ongoing aftercare.

