



Rainwater Retention Technical Manual



Introduction

Modern design requires that water management occurs on-site, whilst ensuring minimal impact on the environment from building and construction activities.

The Aquacomb[®] system is a series of interconnecting polyethylene water tanks or "pods" that are positioned inside a concrete slab to store rainwater. The simplicity of the Aquacomb[®] system provides the designer greater flexibility for many applications.

This technical manual provides sufficient information to design water management solutions for on-site retention (OSR) applications, using the Aquacomb[®] modular water storage system.

Trademark

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Patent

Aquacomb[®] is a registered Patent of Kingspan Water & Energy Pty Limited.

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Design Principles

The Aquacomb[®] system has been designed to be incorporated wholly within concrete slabs that are used in housing, commercial, industrial and any other construction where water management is required. Aquacomb[®] installed in a building or driveway must be a design element of structural engineering approval and construction drawings.

The system has been specifically designed for concrete slabs that are constructed using void formers such as Waffle Pod, Ribraft and cardboard void types. In fact, Aquacomb[®] can be thought of as a functional void former.

Aquacomb[®] can be easily designed into other concrete slab types (with minimal modification) and is also suitable for decks, driveways, lawn and garden areas.

Aquacomb[®] has been **designed to last the life of the slab**, and comes with a 10 year warranty.



Flexible Design to maximise storage

The four key principles for designing an Aquacomb® system are:

- 1. Aquacomb[®] is incorporated into a concrete slab as a non-structural, void former element.
- 2. To allow water to enter the system, an atmospheric vent must be installed.
- 3. The location of the Aquacomb[®] pods within the concrete slab requires a clear area where penetrations for services are not present i.e. bathrooms, laundries and kitchen sinks.
- 4. A pump provides water services to the property from the Aquacomb[®].



Common Townhouse Installation

Water Quality Recommendations

As with any water management system, the quality of the water entering the system will determine the level of cleaning and service required by the owner in the long term. It is recommended, (as with any rain water collection system) that leaf diverters, first flush devices, leaf-gutter guards and charged line flush point pit be specified and installed into each system.

A well designed stormwater system utilising charged lines will incorporate a flush point in a pit. This is recommended for the maintenance and cleaning of gutters and stormwater drainage. All stormwater drainage must be installed with grade to this point.

A good design will incorporate these features as standard items, ensuring trouble free usability over many years.





First Flush and Filter



Leaf Diverter

Pre-System Filtration

Kingspan suppliers with each Aquacomb[®] system a filter assembly that houses an in-line filter with a 1mm appeture screen.the filter assembly is to be installed by the project's plumber. It prevents the ingress of organic material, minimising the requirement to clean the Aquacomb[®] pods. This is also a warranty requirement. The filtration does not preclude the use or benefits of other rainwater harvesting protections at the downpipe and the recommended charge line flush point. The Aquacomb[®] pods are designed for inspection and cleaning as an additional failsafe.



In-line filter

Backflow Protection

The Aquacomb[®] system is an in-slab rainwater storage system. Backflow protection is required for connections with the mains water system in accordance with plumbing regulations. The installing plumber must ensure the installation and any backflow prevention devices comply with current regulations.

Materials, Dimensions and Loading Limits

An Aquacomb[®] pod is manufactured as a complete, sealed unit and is available in both virgin and recycled polyethylene. Virgin pods can be coloured to specification and are suitable for potable water applications.

All pods are 1090mm x 1090mm in footprint and are available in 225mm and 300mm depths. The working area required for each pod, when the standard void former design is used = $1.44m^2$.

Volumes per pods are: 225mm pods = 240 litres & 300mm pods = 320 litres.

The number of pods required per system is simply calculated by dividing the total storage requirement of the system by the capacity of the selected pod.

For example: 5,000 litre storage requirement using 225mm pods: 5,000 \div 240 \simeq 21 pods.

5,000 litre storage requirement using 300mm pods: 5,000 \div 320 \simeq 16 pods.

(NB. This area can be created using many shapes such as "L, T and U shapes.")



Typical Aquacomb[®] installation.

The pods are generally designed as non-structural components or void formers for the slab.

Materials, Dimensions and Loading Limits (continued)

All Aquacomb[®] seals are made from EDPM and have a 70 year design life. These seals are specific to the Aquacomb[®] system and come installed with every system.





Aquacomb[®] flow pipe (black or white).



Typical self-priming jet pump.

Internal connection pipes, called Flowpipes, are used to connect the pods together allowing both water and air to move through the system. The flow pipes are made from polypropylene and are 90mm in diameter. Each pipe has a 'V' groove in the centre to allow for reinforcing bar and comes with two locating rings that ensure correct alignment of the system.

We supply the pumps in a housing for a neat appearance upon installation. The pumps supplied with the Aquacomb[®] system are horizontal, stainless steel self-priming jet pumps. After the initial priming and commissioning they are ideal for pumping clear water and other non-aggressive liquids.

All pumps will have a robust construction, with a stainless-steel shaft and impeller. The pumps will be assessed and tested to requirements of AS4020:2018, which makes the pumps compatible with household water supply applications. Kingspan can install and commission the pumps if required, or we can help train your plumbing subcontractor to complete the installation and commissioning.

Aquacomb[®] seal placed in pod.

Materials, Dimensions and Loading Limits (continued)



Pump with Suction Lift (Left-Handed)

Diagram for Illustrative purposes only.

Compliance

Aquacomb® is compliant to the following standards:

- AS 1646:2007 Elastomeric seals for waterworks purposes
- AS 4020:2018 for drinking water

A good practice guide for design and installation is the HB230-2008 Rainwater Tank Design and Installation Handbook. This Handbook was developed by the Australian Rainwater Industry Development Association (ARID) and the Master Plumbers and Mechanical Services Association of Australia (MPMSAA). It outlines the minimum standards and performance criteria for all development works associated with rainwater tank installations.

On-Site Retention System Design (OSR)

The term "retention" is used to describe the capture, storage and reuse of clean rainwater. Generally the water is used for washing machines, flushing toilets and also provide water to outside taps for cleaning and gardening.

There are three main considerations when designing an Aquacomb® retention system.

- 1. Soil type or category classification that determines the slab thickness and therefore the pod depth.
- The total volume of stored water that is required by councils, water authorities or DA calculations such as SMAF (Stormwater Management Areas: Flow) etc.
- 3. The position of the system within the concrete slab.



Typical Aquacomb[®] General Arrangement before concrete pour

Soil type is determined by a geotechnical report and the specifying engineer will design the concrete slab thickness according to the reactivity of the subgrade. i.e. stable subgrades will generally be designed using 225mm deep pods and reactive subgrades will be designed using 300mm deep pods.

The required volume of stored water can vary widely, depending on the homeowner's or council's requirements. Retention systems are generally in the order of 3,000 litres to 5,000 litres in capacity but can be as little as 1,200 litres and as large as 20,000 litres or more.

Onsite Retention System Design - General Arrangement Considerations

Positioning the Aquacomb® system within the concrete slab is a simple four point process.

- 1. Avoid services that penetrate the slab such as floor waste, water pipes and electrical conduits, especially in wet rooms.
- 2. Be mindful of the location of downpipes and their connection points by overlaying the architectural plans to ensure that inlet/outlet positions are away from windows.
- 3. Position the system away from any concrete beams, misaligned or non-aligned ground surfaces and any other structural elements.
- 4. Identify the ideal location for the pump. Consider pump size and space required, boundary setback, occupant rear access and stormwater overflow lines. Proximity to bedrooms is an important consideration as every pump makes some level of noise. Ideal locations for pumps are off living areas, kitchens, laundries or garages.

Indicating the location of the Aquacomb[®] system within the slab plan is as simple as shading the void former layout as shown in the example below.



Aquacomb[®] system with void former layout.

Onsite Retention System Design - General Arrangement Considerations

(continued)

For easier installation and system efficiency, it is good practice to position the pump as close to the Aquacomb[®] pod outlet point as possible. This ensures minimal disturbance of the concrete slab with pipes and helps reduce the cost of the system for the builder and home owner.

The flow pipes have a "V" shape groove moulded into them at the correct location allowing for the rebar to be fully supported in the groove. The design of the connecting Aquacomb[®] flow pipes ensures that the rebar laid in the beams created by the void formers is unaffected by the Aquacomb[®] system.

In general, the design of the steel bar, mesh and supporting items is unaffected by the inclusion of an Aquacomb[®] system. There is no need to alter the standard reinforcing design when specifying an Aquacomb[®] system.



Aquacomb[®] 3D Drawing

Benefits of the Aquacomb® Retention System

The design of the Aquacomb[®] retention system provides three significant benefits over and above other types of retention systems for designers, builders and property owners.

- 1. It is incorporated early into the structure's concrete slab and is therefore protected from construction damage.
- 2. It requires no excavation or additional concrete slabs for installation and is therefore cost-effective method of achieving DA compliance for water retention.
- 3. The system is completely hidden within the structure's foundation allowing for unrestricted access and views to side and rear yard spaces.
- 4. In comparison to traditional "Above Ground" OSR tanks, the Aquacomb[®] solves issues of "Land use" especially on smaller blocks where it is impossible or challenging to install the traditional Above Ground Water tanks between the building and the property boundary.

Section 1 Note

Site Preparation

An Aquacomb[®] system may be positioned on both cut and filled subgrade, subject to your engineers approval and specifications. Ideally, the following is recommended:

- 1. Subgrade compaction to 98% of standard compaction.
- 2. Screeded sand bedding between the Aquacomb® system and the subgrade.
- 3. Minimum concrete compressive strength of 25 MPa for the slab.

Section 2 Installation Guidelines (OSR)

General

Aquacomb[®] systems are produced as a complete kit including a layout plan ready for on-site assembly. For more specific information please contact:

Kingspan Water Tanks 1300 008 396 aquacomb.com.au

Procedure

Step 1: From the system layout plan, identify all pods with inlet and outlet PVC pipes. Stand these pods up on their edge, as per diagram 1.

IMPORTANT

Step 2: Use Food Grade Grease to lubricate all pipes and seals prior to insertion into the pods.

Push PVC pipes into seal up to the 250mm insert.

- **Step 3:** Repeat steps above for all PVC pipes.
- Step 4: Roll pod over to expose next pair of holes, lubricate inner lip of seals and edge of flow pipes. Push the flow pipes into holes up to the locating rings. Face 'V' grooves towards each other, please refer to diagram 2. (The lower 'V' is to support the bottom steel.)
- **Step 5:** Position all pods as indicated in the system layout plan.
- **Step 6:** Position pods on the ground as per diagram 3. Ensure all seals and pipes are lubricated and are aligned to their corresponding holes.

Locate the 'dog bone' tool and gently pull the pods together until the 'locating rings' are hard up against the seal.



Diagram 1



Diagram 2



Section 2 Installation Guidelines (OSR)

Procedure (continued)

- Step 7: Repeat the steps above for all subsequent pods as per the system layout plan.
- **Step 8:** Check over the complete system ensuring all joints are tight and pods are against locating rings on the flow pipes. Check all PVC pipes are hard against the back of the edge boards. Screw fix PVC end caps to the edge boards.
- Step 9: Remove reinforcement support chairs from under PVC pipes and ensure pipes are level.

By following the above steps the Aquacomb[®] system should be ready for steel placement. For any additional information contact Kingspan Water Tanks.

Section 3 System Testing

Step by step process

- **Step 1:** Ensure that the system is completely sealed and airtight. For more specific information on how to seal the system, contact an approved service technician.
- **Step 2:** Connect the screw cap fitting with air valve to the outlet pipe.
- Step 3: Start the test by pumping the air into the system, making sure that it reaches 6 KPa. Use the pressure gauge periodically to check the hold pressure for at least 4 minutes.
- **Step 4:** Use soapy water sponged or sprayed on all joints to check for leaks (bubbles) while under pressure.
- Step 5: If there is a decrease in pressure in the system, identify the source and perform an appropriate repair. Return to step three to repeat the test.



- **Step 6:** When the test has been completed, de-pressurise the system by removing the test screw cap and replace with original cap.
- **Step 7:** Screw the new cap off against the edge board.
- **Step 8:** Sign off this test record (below).
- Step 9: Submit a copy to the building company or the system owner.

			Pod Installation QA
ob name			Date
Address			
	Pass	Fail	Comments
Edge Boards/Formwork Installed			
Reo Bars Installed			
Plastic Film Installed			
Ground Level and Compacted			
Pods Installed as per Plan/Position			
Inlets/Outlets Installed			
Pipes secured to edge board			
Pipe Insulation Installed			
Pods Pressure and Soap Tested			
Action Required			
nstaller Name			Builder/Representative Name
igned			Signed

Section 4 Caring for the System

General

Congratulations on choosing the Aquacomb® water management system. To get the best out of the system, we suggest the following simple steps are followed:

Step 1: Regular inspections

Aquacomb[®] is designed to be a low maintenance system. Examine the pump and pump housing as well as any exposed pipes for accidental damage. Should you find damage to any component of your system, please ensure you contact your approved service technician.

Step 2: The pump

The only visible part of your Aquacomb[®] system is the pump and the pump housing. Your pump is designed to run with little or no maintenance. If you have any concerns, please refer to your pump operating manual for basic trouble shooting.

Service and maintenance to the pump should only be carried out by an approved service technician. Ensure the technician checks the non-return valve for correct operation every year.

Step 3: Gutter & downpipes

The quality of your water is only as good as the source, and therefore it is important that gutters and downpipes are free from leaves and other debris. Regularly inspect gutters and downpipes and remove any foreign matter. We strongly recommend fitting leaf gutter guards to prevent debris build-up and help keep your water quality at its best.

We recommend cleaning gutters every six months if needed. Ensure you divert the water flow away from the tank via the flush point pit or by any means when cleaning the gutters or roof to prevent ingress of dirty water. Also please ensure you inspect and clean out your first flush device and in-line leaf diverter regulary. The flush point pit is your best way of acheiving the above.

Step 4: Filters

All Aquacomb[®] systems come complete with a pump filter to keep the water clean. This filter should be cleaned as required to ensure proper operation. The filter must be refilled with water before restarting. Check and clean the stainless steel mesh filter to the Aquacomb rainwater entry point monthly or more regularly in stormy weather. The pump system should be checked annually to clean the filter inlet to the Aquacomb[®], the Y filter and to check the backflow device is operating correctly.

Step 5: Smelly water

Smelly water is generally caused by a build-up of leaves and debris in your gutters and down pipes. Regular cleaning of your gutters and downpipes will avoid this problem.

Step 6: Concerns

If you have any questions regarding your Aquacomb[®] system please contact your approved service technician or Kingspan via our website www.aquacomb.com.au.

Appendix Design Schematic



Wall mounted pump rough-in guide

Appendix Design Schematic



Pump rough-in guide

Appendix Technical Data Sheet



Kingspan Water & Energy Pty Limited 3 Herbert PI Smithfield NSW 2164 | aquacomb.com.au | aquacomb.au@kingspan.com | 1300 008 396 Aquacomb - Technical Data Sheet | V1 26/09/2024

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