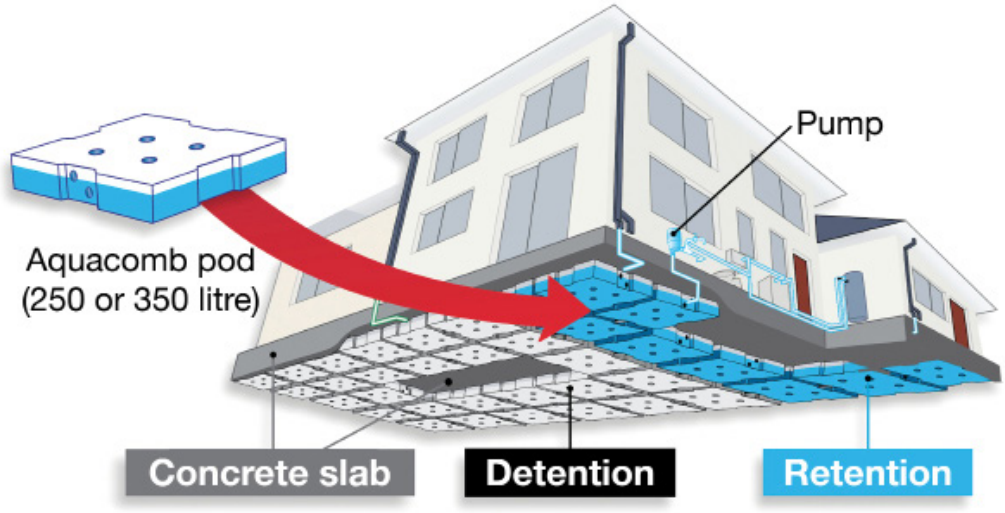
BRANZ Appraised
Appraisal No. 991 [2017]

AQUACOMB WATER SOLUTION SYSTEM



Appraisal No. 991 (2017)

Amended 4th February 2020

BRANZ Appraisals

Technical Assessments of products for building and construction.

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Product

1.1 The Aquacomb Water Solution System is a series of modular 'pods' which serve as tanks for stormwater retention or detention within concrete slab-on-ground waffle raft slabs, driveways and hardstand areas to specific engineering design. The Aquacomb Water Solution System pods are an alternative to conventional non-structural waffle raft slab void formers such as EPS. Stormwater collected on roofs, driveways and hardstand areas is directed into the Aquacomb Water Solution System, and discharged from the system to an appropriate stormwater outfall. Aquacomb Water Solution System pods are interconnected by a series of uPVC flow pipes.

Scope

2.1 The Aquacomb Water Solution System is appraised for use as an under slab or underground stormwater detention or retention system on buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with respect to building height and maximum floor plan area; and,
- with specific engineering design concrete slab-on-ground waffle raft floor slab, driveway and hardstand structures designed and constructed to meet the requirements of the NZBC; and,
- used in conjunction with stormwater drainage systems designed to collect surface water in accordance with E1/AS1 and discharging to a gravity outfall or to a non-potable water supply system.

Building Regulations

New Zealand Building Code (NZBC)

3.1 **In the opinion of BRANZ, The Aquacomb Water Solution System, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet or contribute toward the following provisions of the NZBC:**

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.3. The Aquacomb Water Solution System meets the requirements for imposed gravity loads arising from use and impact [i.e. B1.3.3 (b) and (j)]. See Paragraphs 8.1 to 8.5.

Clause B2 DURABILITY: Performance B2.3.1 (a) not less than 50 years. The Aquacomb Water Solution System meets this requirement. See Paragraph 9.1.

Clause E1 SURFACE WATER: Performance E1.3.3 (a) - (d), (f). The Aquacomb Water Solution System, as part of the drainage system for the disposal of surface water, contributes toward the drainage system meeting these requirements. See Paragraphs 10.1 to 10.11.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. The Aquacomb Water Solution System meets this requirement and will not present a health hazard to people.

Clause G12 WATER SUPPLIES: Performance G12.3.3. Aquacomb Water Solution System meets the requirements for the storage of non-potable water in a manner that avoids the likelihood of illness or injury being caused by the system. See Paragraphs 10.12 to 10.16.

Clause H1 ENERGY EFFICIENCY: Performance H1.3.1 and H1.3.2 E. The Aquacomb Water Solution System will contribute to meeting these requirements. See Paragraphs 12.1 and 12.2.

Technical Specification

4.1 The Aquacomb Water Solution System consists of a series of modular 'pods' which serve as tanks for stormwater retention and detention and are available in two capacities, 250 or 350 litres. Aquacomb Water Solution System pods are interconnected by a series of uPVC flow pipes that are friction fitted with EPDM seals into apertures within the walls of the pods.

4.2 System components and accessories in the Aquacomb Water Solution System supplied by Stormwater Systems Ltd include the following:

Aquacomb Water Solution Pods

- **Pods** are rotationally moulded, virgin grade or recycled polyethylene tanks. Pods are 1100 mm square in plan, and 225 or 300 mm tall, giving water storage volumes of 250 or 350 litres respectively. Pods feature drilled apertures for flow pipes in the pod walls to suit individual system layouts.

Aquacomb Flow Pipes

- **Flow pipes** are 90 mm nominal diameter, 350 mm long interconnecting uPVC pipes, either black or white in colour. Flow pipes feature a notch in the centre of the pipe to a depth of 45 mm to allow for the placement of reinforcement within the structural concrete ribs between the pods. The flow pipes also feature a raised collar at each end of the pipe that locates the pipe snugly against the EPDM seals in the pods and ensures a uniform 100 mm wide space between the pods to allow for typical waffle raft slab structural design.

Aquacomb Seals

- **EPDM compression seals** provide a tight friction fit between hole sawed apertures within the walls of the pods and flow pipes.

Accessories

- **Dog-Bone clamp** – a hand-operated, offset lever action tool used in construction of the Aquacomb Water Solution System on site. The Dog-Bone clamp is used to pull the pods together and engage the Aquacomb flow pipes fully within the corresponding EPDM seals.

4.3 Accessories used with the Aquacomb Water Solution System supplied by the contractor includes the following:

- **Lubricants** - Compatible for use with EPDM, uPVC and Polyethylene.

Handling and Storage

5.1 All components must be dry prior to installation and remain free of dirt. Protection from direct UV exposure should be provided when stored. Care must be used to ensure the components remain free of damage by crushing.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Aquacomb Water Solution System. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

7.1 The Aquacomb Water Solution System is designed to be used for the detention or retention of surface water collected from roofs, driveways and hardstand areas. These two methods are described as follows:

Stormwater Detention

- Stormwater detention is where rain water flowing into the drainage system is temporarily stored during times of high intensity and short duration rainfall. Detained stormwater flows are released from storage in a controlled manner through the use of reduced outlet sizes that releases the stormwater over a few hours proceeding the storm event to the downstream stormwater network. The rate of release is typically designed to be the same or lower than the rate of runoff from a site prior to development, effectively mimicking the natural flows from the undeveloped site. Stormwater detention is an effective means to address symptoms of 'shock loadings' of piped stormwater networks and natural water courses where flooding or overloading of services can occur. Performance criteria regarding flow rates and required storage volumes are typically prescribed by stormwater network utility operators or local authorities.

Stormwater Retention

- Stormwater retention using the Aquacomb Water Solution System is where rain water flowing into the drainage system is stored for occupant use and amenity wherever a non-potable water supply (i.e. water not suitable for drinking or cooking) is appropriate. Typical uses of non-potable water supplies include: garden irrigation, vehicle washing, flushing toilets, clothes washing and the like. Provision of non-potable water supplies are typically non-mandatory, but their use is generally encouraged by local authorities. Stormwater retention is achieved with the Aquacomb Water Solution System by ensuring that the position of the stormwater outlet is positioned at a sufficient height to create a 'weir', ensuring that rain water is not discharged to the stormwater outfall until such time as the pods have reached capacity.

7.2 Waffle raft concrete slabs that include the Aquacomb Water Solution System are not suitable to be fitted with embedded heating systems. See paragraph 12.2.

7.3 Bracing panel hold downs and other structural connectors fixed into the slab must be carefully selected for use with slabs containing the Aquacomb Water Solution System. Contractors must ensure that the upper surfaces of the pods are not penetrated by fixings or drilling. Careful positioning of Aquacomb pods and using drill bits with depth-stop collars are effective in ensuring protection of the pods.

7.4 Where large concrete slabs featuring free joints are proposed to include the Aquacomb Water Solution System, the layout of the Aquacomb system must ensure that the layout of the system avoids the presence of any piped connections through free joints.

Structure

8.1 Structural designs of floor slabs, driveways and hardstand areas containing the Aquacomb Water Solution System shall be subject to Specific Engineering Design by a Chartered Professional Engineer in accordance with the relevant provisions of AS/NZS 1170 and AS 2870. Structural design of floor slabs, driveways and hardstand areas is outside the scope of this Appraisal.

8.2 Structural design of driveways and hardstand areas containing the Aquacomb Water Solution System should give consideration to vehicle loads likely to be experienced throughout the serviceable life of the system. It is recommended that in trafficable areas where large vehicles such as house removals trucks and the like could reasonably be expected, that warning signage advising of vehicle weight limits be placed in readily visible locations.

8.3 The Aquacomb Water Solution System pods are non-structural waffle raft slab void formers for use in waffle raft floor slabs. As such, they are not intended to be subject to live or dead loads once the concrete surrounding the pods has cured.

8.4 The Aquacomb Water Solution System flow pipes that interconnect the individual pods feature a notch in the centre of the pipe to a depth of 45 mm to allow for the placement of reinforcement in the structural concrete ribs between the pods. The flow pipes also feature a raised collar at each end of the pipe that locates the pipe snugly against the EPDM seals within the walls of the pods and ensures a uniform 100 mm wide space between the pods to allow for typical waffle raft slab structural design.

8.5 The placement of flow pipes and inlet and outlet pipes through structural concrete elements of the waffle raft slab may require specific provisions within the structural design. It is the responsibility of the Design Engineer to become familiar with the positions of these pipes and ensure that the structural integrity of the affected elements is not compromised by incorporating the Aquacomb Water Solution System.

Durability

Serviceable Life

9.1 Concrete floor slabs containing the Aquacomb Water Solution System are expected to have a serviceable life in excess of 50 years. Durability of the concrete slab is not adversely affected by the inclusion of the Aquacomb Water Solution System.

9.2 The Aquacomb Water Solution System is expected to have a serviceable life in excess of 50 years as a component of the drainage system, subject to being maintained in accordance with the Aquacomb technical manual and the details contained within this Appraisal. Serviceable life expectancy is dependent on the degree of maintenance carried out throughout the lifetime of the system. Establishment of a contract with commercial tank cleaners is recommended to ensure ongoing maintenance.

Surface Water

10.1 The Aquacomb Water Solution System is designed to be connected downstream of drainage systems that collect surface water from roofs, driveways and hardstand areas. Stormwater is discharged from the Aquacomb Water Solution System to an stormwater outfall as given in NZBC clause E1 (Surface Water).

10.2 Roof drainage systems discharging to the Aquacomb Water Solution System must prevent the entry of leaves and other debris into the drainage system, by incorporating leaf diverters and first flush devices on each downpipe.

10.3 Surface Water collected from driveways and hardstand areas discharging to an Aquacomb Water Solution System must be filtered to prevent the entry of sediment and other debris that are typically present on these surfaces. Consideration shall be given at the design stage to determine a means of filtering stormwater that is appropriate for the site, with regard given to the expected type and volume of sediment. Stormwater silt traps are generally considered appropriate, but selection of filtering devices is outside the scope of this Appraisal.

10.4 Surface Water discharged from Aquacomb Water Solution Systems beneath driveways and hardstand areas shall be conveyed to the stormwater outfall separate of any systems incorporated within floor slabs.

10.5 Inlet and outlet pipes in the Aquacomb Water Solution System are 90 mm diameter uPVC stormwater drainage pipes. Multiple inlets or outlets to the Aquacomb Water Solution System may be required depending on the position of downpipes, gradient of drains and 'Modified Catchment Area' as defined by E1/AS1.

10.6 The layout of pods and connecting flow pipes ensures that there is redundancy in the design in regarding flow paths for water from the inlet to the outlet of the system where it is practical to do so. This will significantly reduce the likelihood of total blockage where water is impeded in its travel from the inlet to the outlet.

10.7 Aquacomb flow pipes feature a notch in the centre of the pipe to a depth of 45 mm to allow for the placement of reinforcement within the structural concrete ribs between the pods. Because of this, the cross-sectional area of a 100 mm diameter drain is approximately 2.5 times that of a single flow pipe.

10.8 Drainage systems upstream of the Aquacomb Water Solution System must incorporate adequate provision to allow for overflow resulting from blockages, high intensity storm events and the like.

10.9 Water collected within the Aquacomb Water Solution System must be discharged to a suitable outfall by way of gravity. The use of the Aquacomb Water Solution System in situations where the stormwater outfall is higher than the outlet at the slab edge is outside the scope of this Appraisal.

10.10 The Aquacomb Water Solution System is suitable for installation within areas of waffle raft floor slabs that are free of penetrations for foul water drainage systems and other ducted services, or where the floor slab may be recessed, i.e. to allow for the construction of sloping floors for wet area showers.

Stormwater Detention

10.11 The Aquacomb Water Solution System can be used in drainage systems where requirements exist for temporary water storage, such as for stormwater detention. The required capacity of the Aquacomb Water Solution System for this purpose and similar design considerations concerning discharge flow rates are dependent on criteria given by stormwater network utility operators or local authorities and as such have not been considered within this Appraisal. Compliance with these requirements are the responsibility of the designer.

Non-potable Water Supply

10.12 The Aquacomb Water Solution System can be used to provide retention or storage of surface water as a non-potable water source. For such uses, the Aquacomb Water Solution System must be connected to non-potable water supply system that meets the relevant requirements of NZBC clause G12 (Water Supplies).

10.13 For the Aquacomb Water Solution System to be used as a non-potable water source, in most cases an electric water pump will need to be included in the reticulation design of the supply system to facilitate practical use of the stored water. Water pumps and the design of the non-potable water supply system is outside the scope of this Appraisal.

10.14 When the Aquacomb Water Solution System is used as a non-potable water source, it is the responsibility of the designer to ensure that the non-potable water supply system shall be installed in a manner to ensure there is no likelihood of cross connection with potable water supplies. Protection to the potable water supply must be provided by way of a backflow prevention device that meets the relevant requirements of NZBC clause G12 (Water Supplies).

10.15 When the Aquacomb Water Solution System is used as a non-potable water source, signage shall be installed that meets the relevant requirements of NZBC Clause G12 (Water Supplies) and F8 (Signs) for identifying the water as non-potable.

10.16 Reticulation pipelines for non-potable water supply systems shall be identified in accordance with NZS 5807.

Maintenance

11.1 Like any stormwater drainage 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 to ensure adequate performance. The Aquacomb Water Solution System requires the use of leaf diverters, first flush devices and stormwater silt traps. Where such devices are installed, the Aquacomb Water Solution System is expected to meet the relevant requirements of NZBC Clause E1 (Surface Water) for the life of the building.

11.2 Access to the system can be gained through entry points or downpipes where accessible, or access points provided adjacent to the inlets to the system.

11.3 Commercial tank cleaning operators should be engaged to inspect the condition of the Aquacomb Water Solution System annually for sediment deposits using Closed-Circuit Television (CCTV) camera equipment. Additionally, CCTV inspection should be carried out at the conclusion of any cleaning operations to confirm the effectiveness of the cleaning. Owners of Aquacomb Water Solution Systems are encouraged to keep copies of CCTV footage as a record of maintenance and to monitor how environmental conditions at their property may be affecting the rate at which sediment deposits accumulate.

11.4 Typical cleaning processes involving vacuum systems to remove sediment and hydro-flushing to carry sediment toward the vacuum inlet that are commonly used for cleaning conventional water storage tanks are also applicable to the Aquacomb Water Solution System.

Energy Efficiency

12.1 Waffle raft floor slabs are concrete slab-on-ground construction. As such, waffle raft floor slabs containing the Aquacomb Water Solution System meet the criteria to be deemed to achieve a construction R-value of 1.3, as given in H1/AS1. The thermal performance of waffle raft slab constructions with the Aquacomb Water Solution System installed are variable depending on the particular end use of the pods (water retention / detention), area of the floor fitted with Aquacomb pods and overall slab design. Because of these variables, assessment of thermal performance of the Aquacomb Water Solution System has not been considered and is outside the scope of this Appraisal.

12.2 Higher R-values than the R1.3 given in H1/AS1 must not be claimed for waffle raft concrete slabs that include the Aquacomb Water Solution System unless a higher R-value is justified by calculation or physical testing. H1/AS1 requires that floors with embedded heating systems have a construction R value of R1.9. As a result, Waffle raft concrete slabs that include the Aquacomb Water Solution System are not suitable to be fitted with embedded heating systems.

Installation Information

Installation Skill Level Requirement

13.1 The Aquacomb Water Solution System must be installed by or under the supervision of, a certifying drainlayer.

System Installation

14.1 Installation must be in accordance with the Aquacomb technical manual and this Appraisal.

14.2 The main points of installation are summarised as follows:

- Pods are placed on a prepared slab platform over the DPM.
- Pods are interconnected by flow pipes and fitted with inlets from downpipes and outlets as required.
- Inlet and outlet pipes are temporarily sealed, and the system is pressure tested to 7 kPa to identify any leaks.
- Concrete reinforcement is placed as required between pods and to the perimeter of the floor, with attention paid to the position of reinforcing around inlet / outlet and flow pipes.
- Concrete is poured and allowed to cure.
- Leaf diverters and first flush devices are fitted to each downpipe and stormwater silt traps are installed where necessary.
- Downstream stormwater drainage is completed and the system is commissioned.

Health and Safety

15.1 Safe use and handling procedures for the Aquacomb Water Solution System are provided in the Technical Literature.

Basis of Appraisal

The following is a summary of the technical investigations carried out.

Investigations

16.1 Site inspections were carried out by BRANZ to assess methods used for the installation of the Aquacomb Water Solution System.

16.2 A structural opinion of the Aquacomb Water Solution System pods confirming their suitability as non-structural waffle raft slab void formers has been given by BRANZ experts.

16.3 An opinion on the durability of components that are part of the Aquacomb Water Solution System has been given by BRANZ experts.

16.4 An opinion of the thermal performance of the Aquacomb Water Solution Systems has been given by BRANZ experts.

16.5 The manufacturer's installation manual that supports the installation details has been examined by BRANZ and found to be satisfactory.

Quality

17.1 The manufacturing process and details of the quality and composition of the materials and components used within the system were obtained by BRANZ and found to be satisfactory.

17.2 The quality of installation of the Aquacomb Water Solution System on site is the responsibility of the drainage contractor in accordance with the instructions of Stormwater Systems Ltd.

17.3 The quality of installation of the stormwater drainage systems connecting both upstream and downstream of the Aquacomb Water Solution System is the responsibility of the drainage contractor in accordance with the provisions of NZBC clause E1 (Surface Water).

17.4 The quality of installation of the non-potable water supply system connected to the Aquacomb Water Solution System is the responsibility of the certifying plumber in accordance with the provisions of NZBC clauses F8 (Signs) and G12 (Water Supplies).

17.5 Building owners are responsible for the maintenance of Aquacomb Water Solution System in accordance with the instructions of Stormwater Systems Ltd.

Sources of Information

- AS 1646: 2007 Elastomeric seals for waterworks purposes
- AS 2870: 2011 Residential Slabs and Footings.
- AS/NZS 1170: 2017 Structural Design Actions.
- AS/NZS 1254: 2010 PVC pipes and fittings for stormwater and water applications.
- AS/NZS 4766: 2006 Polyethylene storage tanks for water and chemicals
- NZS 5807: 1980 Code of practice for industrial identification by colour, wording or other coding.
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

Amendments

Amendment No. 1, dated 4 February 2020

This Appraisal has been amended to update the company name.

BRANZ

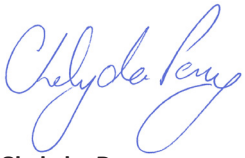
In the opinion of BRANZ, the Aquacomb Water Solution System is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Stormwater Systems Ltd, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
   a) relates only to the product as described herein;
   b) must be read, considered and used in full together with the Technical Literature;
   c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
   d) is copyright of BRANZ.
2. Stormwater Systems Ltd:
   a) continues to have the product reviewed by BRANZ;
   b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
   c) abides by the BRANZ Appraisals Services Terms and Conditions;
   d) warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
   a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
   b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
   c) any guarantee or warranty offered by Stormwater Systems Ltd.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to Stormwater Systems Ltd or any third party.

For BRANZ



Chelydra Percy
Chief Executive

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20 December 2017