HCC 02: Rainwater reuse tank (rain tank)

1. INTRODUCTION

This practice note[1] has been developed to provide information on the minimum design and sizing requirements for rainwater reuse tanks or rain tanks which are used in residential and non-residential applications for on-site stormwater management. Refer to Section 2 for residential applications and Section 3 for non-residential applications.

2. RESIDENTIAL APPLICATIONS

2.1 Description

Rainwater reuse tanks are above or below ground tanks which are used to store rain that falls on roofs and can be collected for non-potable use inside and outside the building. These tanks have two functions: they reduce the total volume of stormwater which runs off your site, especially from the frequent small rainfall events; and they reduce the demand for potable water from the council water supply system.

Rainwater reuse tanks are an important tool for reducing average water use. In most homes, toilet flushing and clothes washing account for around 50% of the total water used. By plumbing the rainwater reuse tank to the toilet and laundry, rainwater can replace nearly half of your annual water consumption.

2.2 Application

Rainwater reuse tanks are appropriate for use in an urban environment where there is a supply of treated potable water available. They are used to collect water from your roof and store it for non-potable use on the property. The water from these tanks can be used primarily for toilet flushing and outside purposes, such as garden watering, and may also be used for laundry supply.

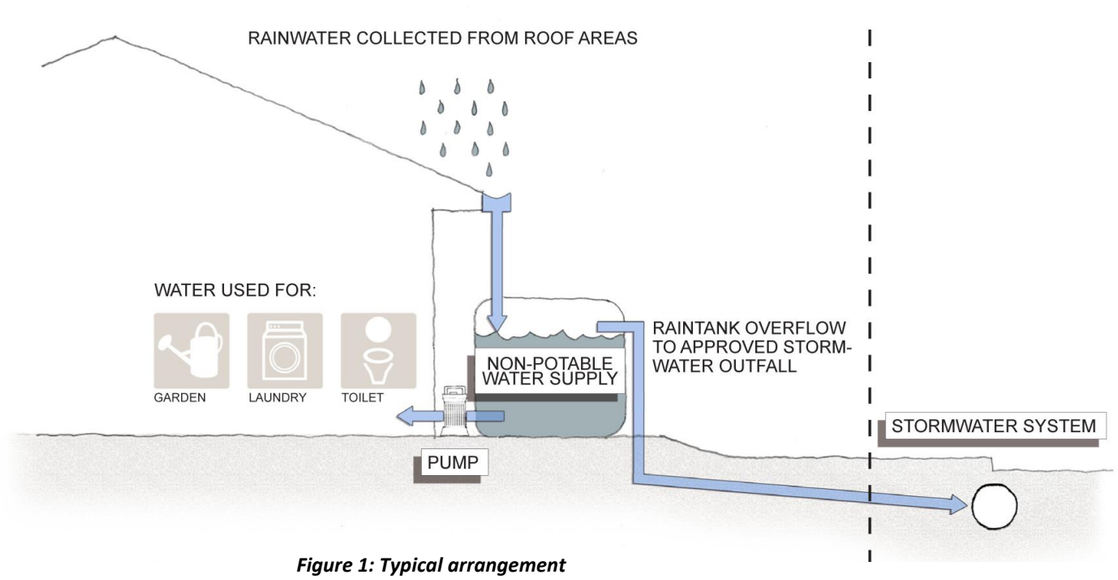

Figure 1: Typical arrangement

2.3 What if I want to provide flow attenuation as well?

If you're wanting to provide flow attenuation as well as rainwater reuse, refer to "Three Waters Management Practice Note - HCC 05: Rainwater reuse and detention tank" for guidance on the design and sizing requirements for dual purpose rainwater reuse tanks. You are expected to demonstrate that soakage is unsuitable for your site before detention is considered.

2.4 Advantages of a rainwater reuse tank

Rainwater reuse tanks provide the following benefits:

- ***They reduce the use of potable water from the public water supply system.***
- ***They reduce the annual volume of water which runs off from your site.***
- ***They improve runoff water quality by filtering out contaminants.***

[1] Three Waters Management Practice Notes are Hamilton City Council controlled documents and will be subject to ongoing review. The latest version can be downloaded from the Hamilton City Council website: http://www.hamilton.govt.nz/our-council/council-publications/manuals/Pages/Three-Waters-Management-Practice-Notes.aspx

2.5 Minimum design requirements

The District Plan (rule 25.13.4.2A) requires that the first 10mm of runoff is retained on-lot. This is required to be achieved through a rainwater reuse tank which overflows to a soakage device. Two approved rainwater reuse tank designs have been prepared for standard residential developments:

- Above ground rainwater reuse tank with a ball valve arrangement - refer to Drawing HCC-02.1.
- Underground rainwater reuse tank with a 'Rainbank' arrangement - refer to Drawing HCC-02.2.

Rainwater reuse tanks must meet the following minimum design requirements:

1. **Tank volume**: Minimum tank volumes for residential applications are as follows:

Equivalent Lot Size	Required Rainwater Tank Volume	Additional Soakage Requirement[1]
100 m2	2,000L	370L (can also be achieved through permeable paving)
200 m2	3,000L	735L (can also be achieved through permeable paving)
300 m2	3,000L	1,100L
400 m2	5,000L	1,450L
500 m2	5,000L	1,850L

1. *Soakage is required in combination with reuse to achieve on-lot retention requirements.*

2. **Catchment:** The whole roof area should be connected where practicable. Only roof water should be drained to the rainwater reuse tank.

3. **Tank use:** The tank is connected via a pump (or gravity) to all toilets, irrigation and ideally to the laundry, and may be connected to the outside taps.

4. **Backup water supply:** A backup water supply must be provided from the potable water supply for those occasions when the approaches empty. Where backup water supply is fed into the rainwater reuse tank should be limited to a nominally low level to maximise rainfall capture. This can be achieved through a float valve.

5. **Backflow prevention:** Backflow prevention is required to protect the potable water supply from cross contamination. Council's preferred option is to plumb the mains water supply into the top of the tank with a registered air gap (minimum 25mm). Where a mixer tap is used in a laundry tab, a non-testable dual check valve is required on the hot water line.

   Where mains water is plumbed directly to the dwelling with a solenoid bypass valve (e.g. underground tanks), this is required to be a testable backflow device.

   A non-testable dual check valve is required at point of supply in accordance with the RITS in all cases.

6. **Contamination:** The tank can be above or below ground (above ground is preferable) but if it is below ground then it must be clearly identified as 'contaminated'. Water from non-roof areas must be prevented from getting into the tank, including the provision of backflow prevention methods to ensure no stormwater surcharges back into the tank from the public stormwater network.

7. **Pipework:** Pipes supplying non-potable water must be coloured (lilac) and clearly marked. All taps connected to the non-potable water source must be clearly marked as not for drinking (see symbol). These taps are generally outdoor garden taps, but it also applies for indoor taps such as the laundry cold water tap. The taps should also be colour coded with either a lilac ring or lilac powder coated.

8. **Access**: Suitable access must be provided to the tank, the pump, and any screens or filters for maintenance and regular inspections. The location of these items must be clearly identified.

9. **Pre-treatment:** It is recommended that some, or all the following are provided:
   - Leaf guards on your gutters
   - Insect screens
   - A first flush diverter which diverts the most 'contaminated' roof runoff away from your tank
   - A tank vacuum type overflow which helps to remove sediment build up from the bottom of your tank
   - A filter at the pump
   - An inlet system which prevents sediment from being stirred up when the tank is nearly empty.

10. **Pump Sizing:** Pumps need to be selected (if available) or designed such that they operate efficiently at low flow rates. Over-sized pumps can lead to increased cost due to power consumption.

11. **Volume control**: Rainwater reuse tanks can be used to meet Waikato Regional Council's volume control requirement. This criterion is as follows:

    A minimum retention of the site pre-development initial abstraction from all impermeable areas shall be provided. If soil conditioning is provided for permeable areas, then retention of initial abstraction is not required for these areas. If soil conditioning is not proposed, then initial abstraction is to be retained for the whole site (impermeable and permeable areas).

Figures 2 and 3 below show typical components for above ground and below ground rainwater reuse tanks.

Refer to NZ Building Code E1 Surface Water, G12 Water Supplies and F8 Signs, and NZS 5807: Part 2 for additional requirements.

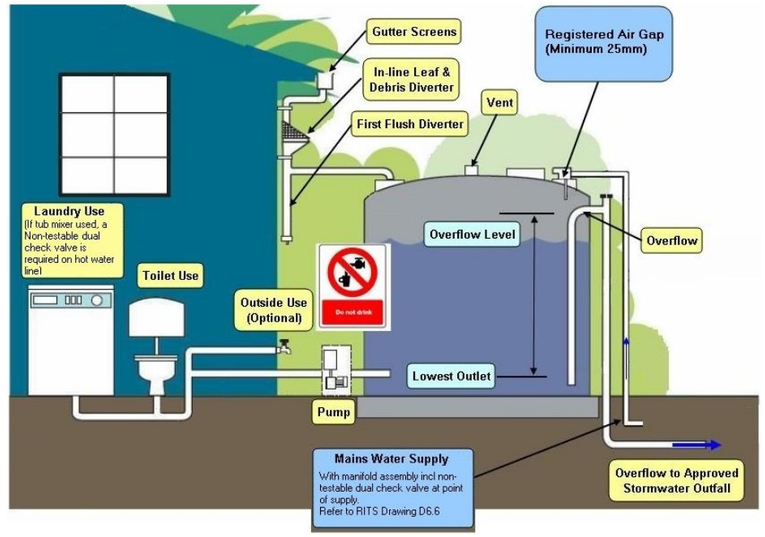

Figure 2: Rainwater reuse tank above ground - typical components

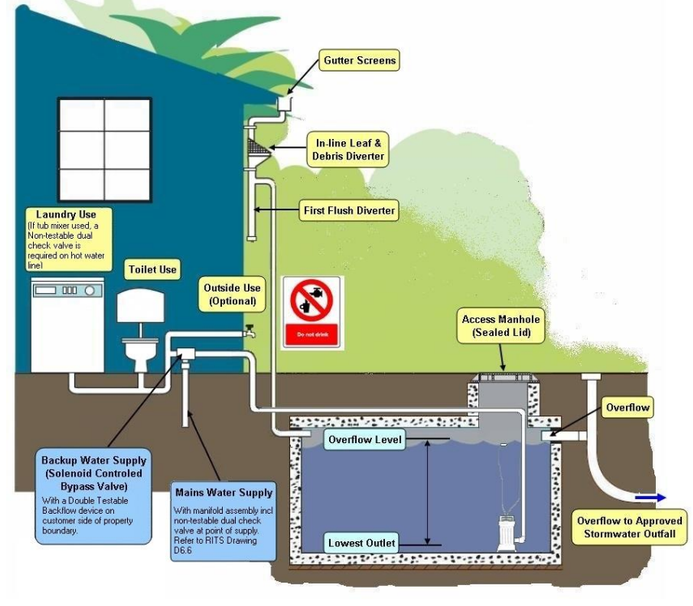

Figure 3: Rainwater reuse tank below ground - typical components

3. NON-RESIDENTIAL APPLICATIONS

3.1 Procedure for calculating the permanent reuse volume for non-residential applications

Rainwater reuse tanks can be used for non-residential or mixed-use developments to reduce the stormwater runoff from impervious surfaces at the site. The working volume is the volume between the lowest take-off and the overflow level. The volume shall be determined using the methodology below. A minimum volume of 5m^3 is recommended.

The methodology uses the following basic steps:

Step 1: Determine gross floor area

Determine the gross floor area **(GFA)** for each of the activities that the building is to be used for. Use activities provided in Table 1 below. If the activity is not listed, then use the one that is the most similar.

Step 2: Determine building occupancy

The average building occupancy **(BO)** is an estimate of the number of people likely to use the building based on gross floor area.

The following table should be used to calculate the probable number of occupants in a building based on gross floor area. If the activity is not provided, then use the most similar activity provided in the table.

Table 1: Building occupancy ratios for different activities

Activity	Floor area to occupant ratio (OR)
Office	25m^2
Showroom	35m^2
Warehouse	50m^2
Shops, retail	35m^2
Restaurant/Dining areas	15m^2
Local shopping centres	35m^2
Manufacturing industry	25m^2
Residential component of mixed use	20m^2

Determine building occupancy number **(BO)** for the building by dividing the gross floor area **(GFA)** for each activity by the floor area to occupant ratio **(OR)** for that activity. Add up the total number of people that will be in the building.

Step 3: Determine roof area that will be connected to the rainwater reuse tank

Roof area **(RA)** = roof area connected to the rainwater reuse tank in m^2.

It is advantageous to maximise the roof area connected to the tank as this increases the water captured for re-use and increases the additional impervious area managed by the tank.

Step 4: Determine the roof area per occupant

The roof area per occupant **(RAO)** is calculated by dividing the roof area that will be connected to the rainwater reuse tank **(RA)** by the building occupancy **(BO)**.

Roof area per occupant (RAO) = RA/BO

Step 5: Determine the rainwater reuse tank permanent reuse volume (m^3)

The harvesting volume that needs to be provided in the rainwater reuse tank is calculated by multiplying the building occupancy calculated in Step 2 by the rainwater reuse tank reuse ratio **(RR)** obtained from Table.2.

Table 2: Rainwater reuse tank reuse volume ratio

Roof area per occupant (RAO)	Rainwater reuse tank reuse ratio (RR)
Less than 15 m^2 of roof per occupant	0.2 m^3 per occupant
15 – 26 m^2 of roof per occupant	0.15 m^3 per occupant
27 – 40 m^2 of roof per occupant	0.125 m^3 per occupant
Greater than 40m^2 of roof per occupant	0.1 m^3 per occupant

Rainwater reuse tank reuse volume (in m^3) = BO x RR

3.2 Example

For a two story office building (250m^2 GFA) with 140m^2 of roof area.

GFA = 250m^2
OR (from Table 2.1 for an office) = 25m^2

BO = **GFA / OR**
= 250m^2 / 25m^2
= 10 people

RA = 140m^2

RAO = **RA / BO**
= 140m^2 / 10 people
= 14m^2

RR = 0.20m ^{3} from Table 2.2 because the **RAO** is less than 15m^2 per occupant

Volume of rainwater reuse tank = **BO x RR**
= 10 x 0.20m^3
= 2.0m^3 or 2,000L

Adopt a recommended minimum of 5,000L rainwater reuse tank for the proposed development.

4. MAINTENANCE

Rainwater reuse tanks need to be maintained regularly by the property owner/occupier to ensure that the system is operating as it is intended, and that water quality is satisfactory.

A summary of rainwater reuse tank maintenance requirements is provided in Table 3 below.

Table 3: Summary of rainwater reuse tank maintenance requirements

Maintenance action	Frequency
Inspect and clean pre-screening devices and filters.	3 months or less
Inspect and clean gutters, overflows, and small diameter orifice.	6 months or less
Inspect tank for sludge/sediment build up, inspect, and clean gutters and clear surrounding vegetation and overhanging trees from roof areas. Air gap and /or testable backflow preventer inspected and tested by certified inspector and results provided to Council.	Yearly or less
Inspect tank structural integrity, pipework, electrical and pump by qualified professionals.	5 yearly or less

During power outages the pumped non-potable water supply from the rainwater reuse tank to the toilet, irrigation and laundry will not operate.

Maintenance requirements for a below ground tank will be more onerous than an above ground tank due to access issues.

5. SUMMARY OF PLANNING REQUIREMENTS

Your rainwater reuse tank must be consented either as part of the whole site's building consent or as a separate building consent.

For details on building consents please contact Hamilton City Council's Building Control Unit phone (07) 838 6699.

If you comply with the minimum design requirements outlined in this practice note, and the pre-approved rainwater reuse tank design drawing, specific engineering design is not required for your rainwater reuse tank.

As-laid plans are required for your rainwater reuse tank, authorised by a registered drain layer, and shall be provided to council.