# HCC 02: Rainwater Reuse System (Rain Tanks)

## 1. INTRODUCTION

This practice note[1] has been developed to provide general information on the minimum design and sizing requirements for Rain Tanks proposed 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

Rain 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.

***Rain 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 Rain Tank to the toilet and laundry, rain water can replace nearly half of your annual water consumption.***

### 2.2 Application

Rain 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. Council recommends a minimum volume of 5,000 litres or $5m^3$ for these tanks, unless the roof area is less than $60m^2$ and the building is single level, in this case a 3,000 litre or $3m^3$ tank is probably suitable. The water from these tanks can be used for toilet flushing and outside purposes, such as garden watering. To get the most out of the system it should also be used for laundry supply.

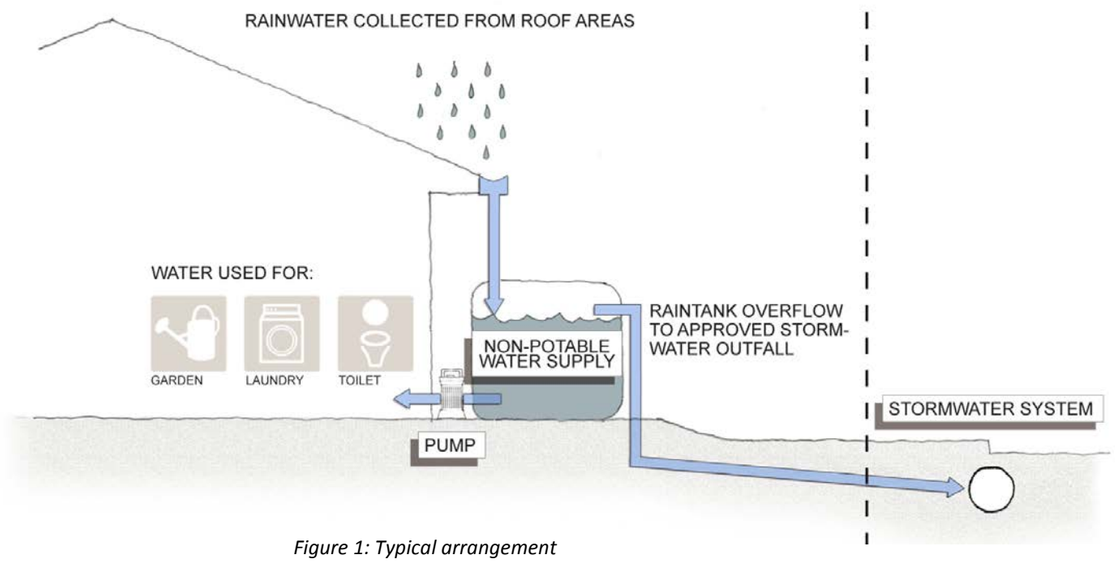


*Figure 1: Typical arrangement*

### 2.3 What if I want to provide stormwater attenuation as well?

Refer to "Three Waters Management Practice Note - HCC 05: Rainwater Reuse and Detention System" for guidance on the design and sizing requirements for dual purpose rain tanks. You are expected to demonstrate that soakage is unsuitable for your site before detention is considered.

### 2.4 Advantages of a Rain Tank

***Rain 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.***
- ***Improves 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 Rain Tank must meet the following minimum design requirements:

- **Tank volume**: A minimum tank volume of **5,000L or 5m$^3$** is recommended, unless the dwelling is less than 60m$^2$ and single level, then a **3,000L** or **3m$^3$** tank is suitable. Rural-residential use requires a minimum of **22,000L** or **22m$^3$**.

- **Catchment:** The whole roof area should be connected where practicable. Only roof water should be drained to the rain tank.

- **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.

- **Backup water supply:** A backup water supply must be provided from the potable water supply for those occasions when the rainfall is not enough to keep the tank supplied.

- **Backflow prevention:** Some form of 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). Alternatively a testable backflow device (testable double check valve) can be provided at the water mains side of the raintank.

- **Contamination:** The tank can be above or below ground 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.

- **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.


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

- It is advisable to provide some or all of the following:
  - Some form of leaf guards on your gutters
  - Insect screens
  - A first flush diverter which diverts the most 'contaminated' roof runoff
  - 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.

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

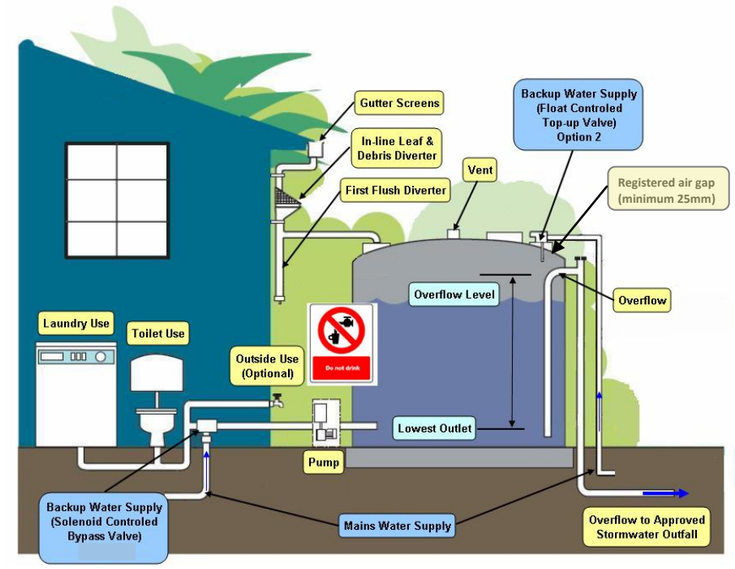


*Figure 2: Rain Tank above ground - typical components*

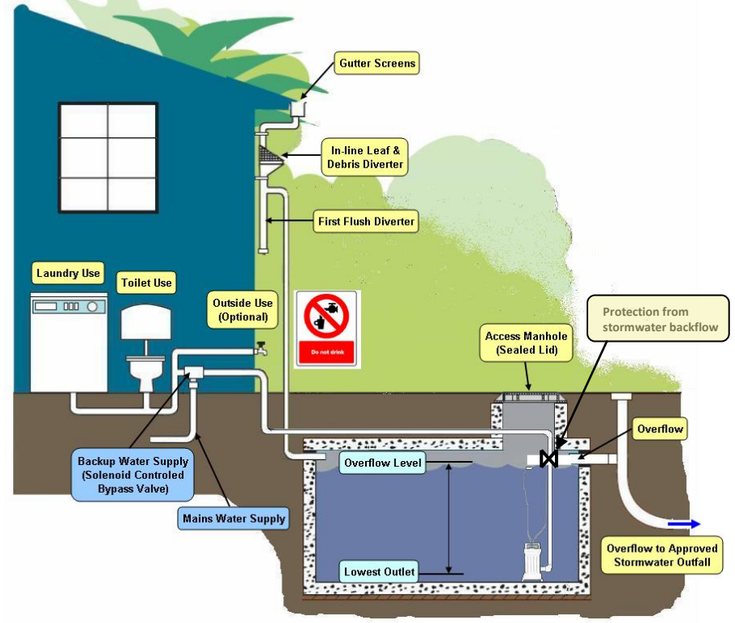


*Figure 3: Rain Tank below ground - typical components*

# 3. NON-RESIDENTIAL APPLICATIONS

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

Rain 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 takeoff 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 type of 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 Rain Tank

Roof area **(RA)** = roof area connected to the Rain Tank in $m^2$. Note it is still better to maximise the roof area connected to the tank as this increases the water captured for re-use and also 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 rain tank **(RA)**, by the building occupancy **(BO)**.

**Roof area per occupant (RAO) = RA/BO**

### Step 5: Determine the Rain Tank permanent reuse volume ($m^3$)

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

*Table 2: Rain Tank reuse volume ratio*

| Roof area per occupant (RAO) | Rain 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 |

**Rain Tank reuse volume (in $m^3$) = BO x RR**

## 3.2 Example

*For a two story office building (250$m^2$ GFA)*, 140$m^2$ 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** = 0.20$m^3$ from Table 2.2 because the **RAO** is less than $15m^2$ per occupant

Volume of Rain Tank = **BO x RR**
= 10 x $0.20m^3$
= $2.0m^3$ or 2,000L

Adopt recommended minimum of 5,000L Rain Tank for proposed development.

# 4. MAINTENANCE

Rain Tanks need to be maintained regularly to ensure that the system is operating as it is intended and that water quality is satisfactory.

In summary maintenance requirements are:

*Table 3: Summary of Rain 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.<br>Testable backflow preventer inspected by certified inspector. | Yearly or less |
| Inspect tank structural integrity, pipework, air gap, electrical and pump by qualified professionals. | 5 yearly or less |

During power outages the pumped non-potable water supply from the Rain 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 system 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.

As long as you comply with the minimum design requirements outlined in this practice note, specific engineering design is not required for your rainwater reuse system. As-laid plans are required for your rainwater reuse system, authorised by a registered drain layer, and shall be provided to council.