

Rainwater harvesting systems in New Zealand houses

Domestic rainwater harvesting systems collect rainwater and store it for use by the household. That use may be just watering the garden or flushing the toilet, but with the right treatment, rainwater can provide for every need, including food preparation and drinking water.



THE SIMPLEST rainwater collection systems are made up of:

- a collecting area – typically a roof
- pipes to a tank
- devices to keep out debris before the water gets to the tank
- taps or piping to provide access to the water.

Systems just providing water for the garden normally rely on gravity. Larger systems supplying water into a house typically require a pump and will require filters and treatment devices where it is a potable (drinking water supply).

Rainwater harvesting systems are not the same as greywater reuse systems. Greywater reuse systems take wastewater from baths, showers and hand basins and, in some cases, from laundries. Their use is usually limited to irrigation or toilet flushing.

BRANZ surveys conducted in 2014 and 2016 found that most people favour installing rainwater systems for cost savings (reduced town supply consumption), allowable garden irrigation during water restrictions and environmental reasons.

Improving a building’s resilience – ensuring that it can function properly during and after a natural disaster – is another reason. In Wellington, for example, the town water supply network crosses faultlines at numerous locations. After a big earthquake, normal supply may not be available for 2 months. Residents in some locations could have to wait over 3 months.

The two BRANZ surveys indicated that the main barriers to installing rainwater systems in New Zealand buildings are cost, education and space for the tanks.

Most people (around 90% in the 2014 BRANZ survey) are happy to use rainwater

for the laundry, toilet flushing and irrigation. Half see rainwater as acceptable for drinking and cooking/food preparation.

Clean water

Keeping the water clean is critical as water can become unhealthy if it is contaminated. Bird or animal droppings or dead animals can cause microbial contamination. Chemical contamination can come from things such as pesticide or herbicide spray drift onto the roof or use of inappropriate materials to collect the water .

To ensure the water is clean enough for the chosen end use, it’s important to consider:

- catchment area – it must be clear of tree branches that provide places for birds to perch or roost or for cats, possums or rodents to access the roof
- materials selection
- component specification – roof

claddings must be suitable for potable water collection

- the need for regular maintenance.

Roof catchment

Suitable roofing materials include:

- zinc/aluminium alloy-coated or galvanised (zinc) steel, whether uncoated, factory-coated or painted
- metals such as zinc, aluminium or stainless steel
- concrete or clay tiles
- untreated timber shingles (usually imported western red cedar)
- butyl rubber
- asphalt shingles
- bitumen membranes.

Roofs must not be painted with lead or chromium-based paints. (Some special-purpose, lead-based paints containing red lead are still available, and anti-rust primers sometimes contain chromium salts.) Do not use roofs where the construction includes uncoated lead flashings, treated timber or an older asbestos-cement roof cladding.

Install mesh leaf guards in the roof gutters and leaf screens in the downpipes. Materials suitable for gutters and downpipes include uPVC, factory-coated zinc/aluminium alloy-coated steel or galvanised steel, copper, aluminium or polyethylene/polypropylene.

Install a first-flush diverter to divert the first volume of rainwater (which carries a lot of dirt and debris) away from the storage tank.

Tanks

Water storage tanks can be above ground or underground. They can be made of galvanised steel, zinc/aluminium alloy-coated steel (only if not in ground contact), fibreglass, plastic or concrete. Some materials may affect water taste when they are new. A galvanised steel tank may initially cause a metallic taste. A new concrete tank may release lime that increases the pH of the water and cause a slightly bitter taste.

Filters and treatment

Filters or treatment systems should be specified depending on the required end use of the water. Even when leaf screens and first-flush diverters are used, it is still possible for harvested rainwater for a potable supply to be contaminated with bacteria, viruses, algae, pesticides and other contaminants. Filtering and treating the water can greatly reduce the presence of these and can also help remove odours. Some local authorities will only allow rainwater to be used for drinking, food preparation and bathing if the water is treated.

Filters can be located to treat all the water entering the house from a rainwater tank or can be fitted under a kitchen bench to just provide cleaner water from one tap. Several different types of filter are typically used together:

- Mesh filters can filter out sediment and dirt and some organisms such as *Giardia* cysts. This type of filter extends the life of tapware, appliances and filters that come after them.
- Carbon filters reduce the quantities of chemicals, numbers of bacteria and unwanted tastes and odours.
- Reverse osmosis filters pass water through a semi-permeable membrane. This type of filter can filter out lead, pesticides and bacteria.

A treatment system can be specified after the filtration if required. Among the more common treatment options for rainwater collection are:

- ultraviolet systems that expose water to the light from ultraviolet bulbs – this disrupts the DNA of micro-organisms such as bacteria and viruses, stopping them from multiplying
- ozone treatment kills micro-organisms and can reduce pesticide levels and remove unpleasant odours.

Legal requirements

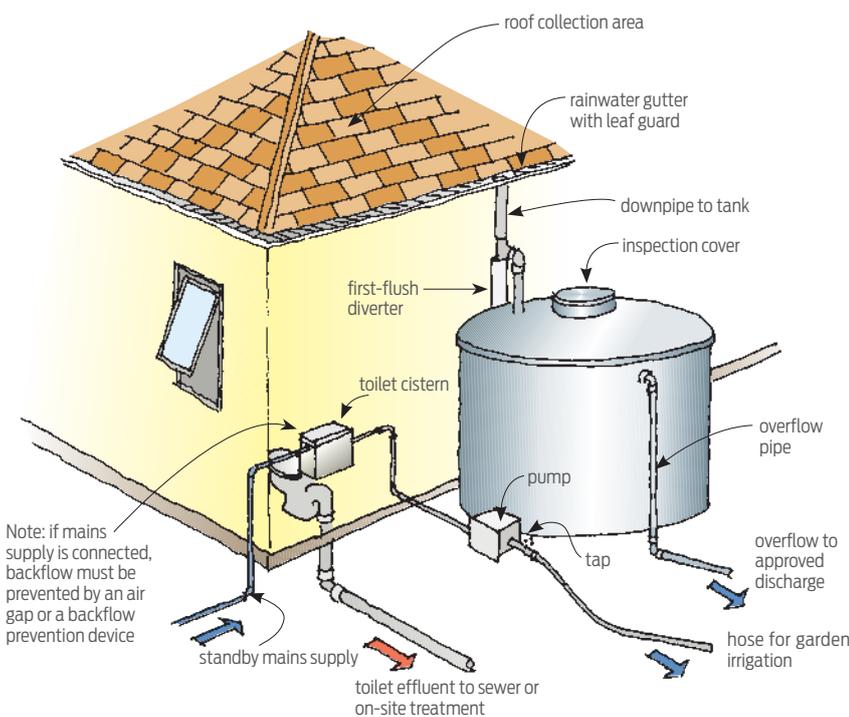
Rainwater systems must meet Building Code requirements. These include a requirement for adequate potable (drinkable) water to be provided for consumption, oral hygiene, utensil washing and food preparation. This potable water supply must be protected from contamination and must not contaminate the water supply system or source.

The Building Code also requires adequate water supply to sanitary fixtures (toilets, baths, showers and sinks).

A building consent will normally be required for larger tanks, for tanks that are elevated and for connections to a house that also gets mains supply water. In this latter case, a qualified plumber must be used and a backflow prevention device installed to prevent the mains water system from being contaminated. Annual inspection may be required.

Roofs, pipework and tanks must meet the requirements of AS/NZS 4020:2005 *Testing of products for use in contact with drinking water*.

Lilac piping is adopted through AS/NZS 3500 *Plumbing and drainage* series to indicate non-potable supply – for example, rainwater used just to flush toilets.



Schematic drawing of rainwater harvesting system used for garden irrigation and toilet flushing.



More information

Fact sheet 4 *Water quality in New Zealand rainwater harvesting systems*

Fact sheet 5 *Benefits of rainwater and greywater systems in New Zealand houses*

Fact sheet 6 *What is holding back rainwater and greywater systems in New Zealand?*

Bint, L. (2017). *Performance of commercial rainwater and greywater systems*. BRANZ Study Report SR383. Judgeford, New Zealand: BRANZ Ltd.

Bint, L. & Jaques, R. (2017). *Drivers and barriers to rainwater and greywater uptake in New Zealand*. BRANZ Study Report SR382. Judgeford, New Zealand: BRANZ Ltd.

Garnett, A. & Bint, L. (2017). *Calculating potential network savings through employing rainwater and greywater systems*. BRANZ Study Report SR384. Judgeford, New Zealand: BRANZ Ltd.

www.level.org.nz: This BRANZ website has information about rainwater harvesting at www.level.org.nz/water/water-supply/mains-or-rainwater/

Maintenance

Regular maintenance is important to keep the water clean.

Every 3–6 months, inspect the gutters, leaf guards and drainpipes and clean as necessary. Disconnect the pipes to the water tank first if possible.

Every 12 months, you should:

- inspect and clean the roof – disconnect the pipes to the water tank first if possible
- prune away any overhanging branches
- check tank inlets, covers and filters and clean as required
- check the tank exterior and pipes for structural integrity, leaks and seepage – any damage should be repaired or the components replaced

- check for evidence of access by animals, birds or insects, the presence of algal growth and accumulated sediment.

Sediment in the tank should be removed as required. This can be done without emptying the tank by siphoning, pumping, through a scour valve (if the tank has one) or in some cases by using a swimming pool vacuum cleaner. Where sludge cannot easily be removed, the tank may need to be emptied and cleaned. This is best done by professional tank cleaners.

Filters occasionally need replacing – how often depends on water use. For treatment systems, follow the manufacturer’s instructions on maintenance.

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