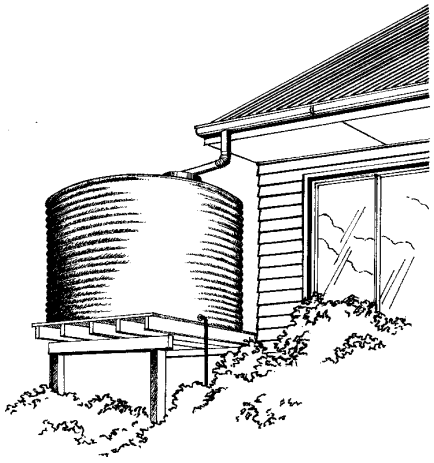
WaterWise
in the Home

technical sheet

Rainwater Tanks

Rainwater tanks have long been a source of domestic water in Australia. At one time, they were a standard feature of suburban backyards, only to be phased out as urban water supply services expanded. Today, rainwater continues to meet the household needs of many rural residential and farming communities. Tanks have also been reintroduced into some urban areas by people looking for ways to play a part in protecting the environment or who consider rainwater to be a healthy alternative.



Is a Rainwater Tank Right for you and your Water Needs?

Rainwater tanks can help save water, but before installing one, several factors should be considered:

- capital and maintenance costs.
- the type of tank that will suit your needs
- the work involved in upkeep
- whether a tank will provide sufficient water for your needs
- local council regulations and restrictions
- local Fire Service recommendations.

A rainwater tank system is only a water supply option and should be chosen only after study of the local conditions and other potential water sources.

Regulations

A number of health, building and town planning regulations may need to be taken into account when considering a rainwater tank. Particularly in northern areas, State regulations related to mosquito control should be followed. These regulations vary from council to council, and may include requirements relating to:

- minimum tank capacity
- separate plumbing for rainwater tank and town supply
- use of town water to supplement the rainwater tank supply (constant flow schemes)
- disposal of overflows from rainwater tanks
- provision of fire protection.

Water Quality

Water quality is a potential problem with all roof-water systems, especially in urban and industrial areas. Tests have shown that tank-water often fails to meet microbiological guidelines for drinking water quality. Therefore, use of rainwater tanks for drinking water in urban and industrial areas is not recommended.

Water quality in rainwater tanks can be affected by:

- atmospheric pollution
- bird and possum droppings
- roofing materials and paints
- trapped insects and small animals
- leaves and dust

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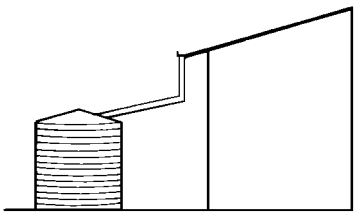
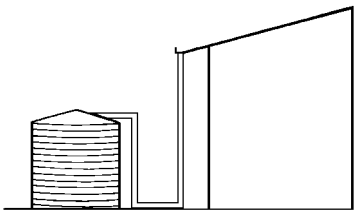
WaterWise is a joint initiative of
the State Government,
the Local Governments of Queensland
and the Water Industry.

The following rainwater tank installation and maintenance practices will ensure the best possible water quality:

- Direct cross connections between rainwater tanks and mains water supply is not permitted. This ensures contamination from one source does not affect the other.
- Installation of the downpipe should ensure no water or rubbish can remain in it between rain periods.



Ideal method



Incorrect method

- It is desirable to have a "foul flush" device that diverts the first 10 litres of water which carries sediment and litter away from the tank.
- Filtering of the rainwater is a good idea to remove sediment.
- Appropriate screening of tank inlets to prevent entry by insects and small animals.
- Keep gutters clean and the roof clear of overhanging vegetation.
- If the tank is in the ground, ensure that manholes are sealed to prevent stormwater entering.
- To help reduce corrosion in galvanised steel tanks, installation of a dispenser containing crystals of metaphosphates prior to initial filling is recommended. Alternatively, a long life food grade polymer coating can be used.
- It is desirable to minimise light entering the tank to inhibit algae growth.
- Install a tap at the base of the tank to drain sludge.
- Tanks should be drained and cleaned every few years to remove sediment.
- Tanks should not be used in conjunction with roofing painted with lead-based paints or tar-based coatings.
- Any PVC pipes connected to the tank should be lead free.
- If sources of lead on the roof (e.g. flashing), are suspected to be contributing lead to the rainwater, have the water tested.
- Runoff from new fibrous cement roofs should be discarded for an entire wet season due to the leaching of lime.
- Kill mosquito wrigglers by adding sufficient kerosene to coat the surface or an approved larvicide to the tank.
- Water samples from the tank should be tested regularly for quality.
- If the water is to be used by the general public, provision must be made for monthly water quality testing.

NOTE: If tank water is for garden use only, less attention to water quality is needed.

Choosing a Rainwater Tank

The suitability of a rainwater tank system must be examined in terms of its potential to provide an acceptable level of service, i.e., the amount of water the tank can reliably supply on a daily basis. This depends on:

- the quantity of rain in the area and the length of the dry season.
- the roof area available.
- the volume of water required.

Rainwater tank systems are usually classified according to the material the tank is made of as this is the most expensive component. The main types are described below.

Galvanised Steel

This is the most common type of tank and is available with rust-resistant coatings such as Zincalume. It is the most inexpensive of the range, but has a limited life span.

Rectangular or modular tanks are also available in galvanised steel.

Fibreglass

Fibreglass tanks, although more expensive, are long lasting because they resist corrosion and are not generally affected by chemicals or moisture.

Fibreglass tanks should be sealed with a black covering to ensure minimum light entry.

Concrete

Concrete and ferro-concrete tanks are strong and long lasting and can be installed underground. Larger tanks often have to be built on-site.

They require adequate flushing to prevent objectionable tastes when new.

Polyethylene

Thick wall black polyethylene tanks are now available.

They require adequate flushing to prevent objectionable tastes when new.

Tank Sizing

The required size of a rainwater tank will depend on:

- number of people using its contents
- water consumption by these people
- water usage e.g. drinking, cooking, washing etc.

If you are looking at supplementing an existing water supply with a tank, the size of tank chosen will most likely depend on cost and the range of uses for which the tank is required. However, if the tank water is to be your sole supply, the following investigations are essential in order to establish a reliable water supply.

STEP 1 - Determine the size of the roof

You need to know the roof area from which the water is to be collected. The slope (pitch) of the roof is unimportant, it is the flat or plan area that matters.

STEP 2 - Determine the average annual rainfall

Refer to Figure 1 to determine the average annual rainfall for your locality. If you have a rainfall station nearby, use the average annual rainfall of that station. Contact the Bureau of Meteorology to locate the nearest rainfall station to you.

STEP 3 - Calculate demand.

First, decide what the rainwater is to be used for. An assessment of the average daily water use per person in Queensland is presented in Figure 2. This may help you to estimate likely demand .

It is likely that demand will have to be less if tank water is the only supply. (**Note:** Use will vary throughout the year).

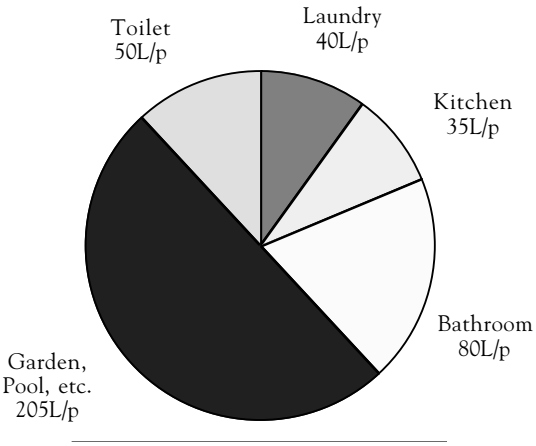


Figure 2.

STEP 4 - Estimate the capacity required.

Select the appropriate section of **Table 1** or **Table 2** for the average annual rainfall in your area. Using the average annual rainfall for your area, your roof area and the demand, read the required rainwater tank capacity in kilolitres.

In many instances the rainfall and roof area may not be sufficient to maintain the required demand. The use of water conserving practices, appliances and devices may then be necessary to reduce the estimated demand.

Degree of security.

Note: Tables 1 and **2** have been prepared using 99% and 90% degree of security respectively. This means that the rainwater tank system should supply the demand you have selected 99% or 90% of the time.

STEP 5 - Checking the calculations.

To ensure that the size calculated will yield sufficient water through a dry season, determine how many days it would take to empty the tank with the estimated demand and no rain. Compare this with the longest time you could expect to go without rain in your area.

Worked Example

1. Roof area - House and garages connected
   = 300 m^2

2. Average annual rainfall from annual rainfall map of Queensland (near Warwick)=800mm

3. Demand for inside house use only @ 100 L/person x 3 = 300 L/day

4. Rainfall area from average annual rainfall map of Queensland = Area 1

∴ Storage vol. required Table 1 = 55kL
Table 2 = 22kL

STORAGE VOLUME (kL)

Rainfall (mm)	Roof Area (m^2)	Demand (L/day) 100	200	300	400	500	600
400	100						
	150	56					
	200	18					
	250	16					
	300	13	113				
600	100	54					
	150	14					
	200	11	108				
	250	11	35				
	300	10	28	162			
800	100	18					
	150	10	50				
	200	9	37				
	250	8	25	76			
	300	7	21	55	101		
1000	100	13					
	150	10	35				
	200	8	25	76			
	250	8	22	48	128		
	300	6	22	47	69	270	
1200	100	10	50				
	150	10	28	76			
	200	7	21	55	101		
	250	6	21	38	69	126	
	300	7	20	31	56	108	151

Area 1

5. Amount of time this will last with no rain
   55kL tank = 183 days or 6 months
   22kL tank = 73 days or 2.5 months

Cost of water from rainwater tank

You can work out the cost per kilolitre of water from your system. The purchase price of a rainwater tank is not the only expense. Don't forget the cost of transportation, installation, alterations to gutters and downpipes, a tank stand or foundation, additional plumbing, a pump and a device to reject initial run-off after a dry period. Allow about 15% of the capital cost to cover interest and depreciation each year over 10 to 15 years.

Cost per kilolitre =

$$\frac{\text{Cost of your system x } 0.15}{\text{Yield in litres per day x } 0.365}$$

Worked Example

Cost per kilolitre =

$$\frac{\$3{,}000 \text{ x } 0.15}{300 \text{ x } 0.365}$$

= $4.10 per kilolitre

The cost of rainwater can vary from $1.50 to over $4.00 per kilolitre. This is compared to the average cost of reticulated water in Queensland of $0.46 per kilolitre.

How to Disinfect your Tank

If for some reason you have doubts on the microbiological quality of the water it can be disinfected to make it safe to drink. Sodium hypochlorite (available at swimming pool shop as a 12.5% chlorine solution) or calcium hypochlorite (available at swimming pool shop as 75% available chlorine) can be used. It takes about 5 milligrams of chlorine per litre to disinfect water. This converts to 40 millilitres of sodium hypochlorite or 7 grams of calcium hypochlorite per 1000 litres of water.

It is important to mix the disinfectant in a plastic bucket - in the open air - before adding it to the tank. After adding it to the tank mix it thoroughly. You should be able to smell the chlorine faintly an hour or so after treating the water. If you can't you may need to add a similar amount of chlorine again. Be careful not to overdose the tank. Ideally the tank water should not be used for 24 hours to enable the chlorine to dissipate, and for harmful microorganisms to be destroyed.

Australian Standards

Rainwater tanks are covered by the following Australian Standards:

AS 2070 Plastic materials for food contact use

AS 2179 Metal rainwater goods - specification

AS 2180 Metal rainwater goods - selection and installation

TABLES 1

99% Reliability

Note: *The contents of this Table are based - on the Water Resources model for Rainwater Tanks*

STORAGE VOLUME (kL)

Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
400	100						
	150	56					
	200	18					
	250	16					
	300	13	113				
600	100	54					
	150	14					
	200	11	108				
	250	11	35				
	300	10	28	162			
800	100	18					
	150	10	50				
	200	9	37				
	250	8	25	76			
	300	7	21	55	101		
1000	100	13					
	150	10	35				
	200	8	25	76			
	250	8	22	48	128		
	300	6	22	47	69	270	
1200	100	10	50				
	150	10	28	76			
	200	7	21	55	101		
	250	6	21	38	69	126	
	300	7	20	31	56	108	151

Area 1

STORAGE VOLUME (kL)

Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
400	100						
	150						
	200	38					
	250	24					
	300	19					
600	100	0					
	150	32					
	200	20					
	250	20					
	300	19					
800	100	19					
	150	13					
	200	12	38				
	250	11	31	94			
	300	10	26	58			
1000	100						
	150						
	200						
	250						
	300						
1200	100						
	150						
	200						
	250						
	300						

Area 2

STORAGE VOLUME (kL)

Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
400	100						
	150	55					
	200	31					
	250	24					
	300	20	110				
600	100	60					
	150	25					
	200	19	120				
	250	20	72				
	300	20	50	180			
800	100						
	150						
	200						
	250						
	300						
1000	100						
	150						
	200						
	250						
	300						
1200	100						
	150						
	200						
	250						
	300						

Area 3

STORAGE VOLUME (kL)

Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
400	100						
	150						
	200						
	250						
	300						
600	100						
	150						
	200						
	250						
	300						
800	100						
	150						
	200						
	250						
	300						
1000	100	23					
	150	23	50				
	200	20	46	90			
	250	20	44	75	138		
	300	11	45	69	101	210	
1200	100	21	84				
	150	23	47	126			
	200	19	42	80	168		
	250	17	45	69	101	210	
	300	20	45	63	94	140	252

Area 4

STORAGE VOLUME (kL)

Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
1000	100	24					
	150	23	59				
	200	19	47	120			
	250	18	43	83	175		
	300	15	42	71	117	276	
1500	100	16	44				
	150	10	34	65	185		
	200	9	32	53	87	246	
	250	11	24	47	75	109	221
	300	0	20	47	68	90	131
2000	100	12	35	84			
	150	10	32	53	87	246	
	200	9	25	50	70	116	168
	250	8	23	42	63	88	120
	300	0	18	37	63	75	105
2500	100						
	150						
	200						
	250						
	300						
3000	100		21	38	69	270	
	150		14	32	47	70	104
	200			25	42	53	75
	250			23	32	53	66
	300				27	50	63

Area 5

TABLES 2

90% Reliability

Note: *The contents of this Table are based - on the Water Resources model for Rainwater Tanks*

STORAGE VOLUME (kL)

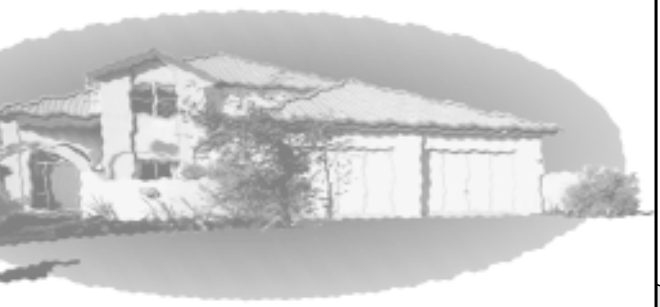
Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
400	100						
	150	15					
	200	10					
	250	7	60				
	300	5	28				
600	100	11					
	150	5					
	200	6	22				
	250	4	14	57			
	300	4	11	32			
800	100	7					
	150	4	22				
	200	3	14	43			
	250	0	10	25	76		
	300	0	8	22	43	168	
1000	100	5	38				
	150	4	14	57			
	200	0	10	25			
	250	0	8	19	38	95	
	300	0	8	15	27	54	114
1200	100	4	22				
	150	4	11	32			
	200	0	8	22	43		
	250	0	8	15	27	54	
	300	0	8	12	22	40	65

Area 1

STORAGE VOLUME (kL)

Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
400	100						
	150	23					
	200	14					
	250	10					
	300	8	47				
600	100	24					
	150	11					
	200	8	48				
	250	8	27				
	300	8	22	72			
800	100	10					
	150	5	24				
	200	4	19	64			
	250	4	14	34			
	300	4	11	29	48		
1000	100						
	150						
	200						
	250						
	300						
1200	100						
	150						
	200						
	250						
	300						

Area 2



in the Home

AVERAGE ANNUAL RAINFALL MAP OF QUEENSLAND

Figure 1

TABLES 2 - 90% Reliability (Continued)

STORAGE VOLUME (kL)							
Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
400	100						
	150	20					
	200	17					
	250	14	60				
	300	12	40				
600	100	24					
	150	13					
	200	11	48				
	250	11	30				
	300	10	25	72			
800	100						
	150						
	200						
	250						
	300						
1000	100						
	150						
	200						
	250						
	300						
1200	100						
	150						
	200						
	250						
	300						

Area 3

STORAGE VOLUME (kL)							
Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
400	100						
	150						
	200						
	250						
	300						
600	100						
	150						
	200						
	250						
	300						
800	100						
	150						
	200						
	250						
	300						
1000	100	16	50				
	150	15	33	75			
	200	12	32	54	100		
	250	12	22	50	75	125	
	300	10	30	48	66	99	150
1200	100	14	40				
	150	14	32	59			
	200	12	29	53	79	158	
	250	10	30	48	66	99	150
	300	12	29	43	65	86	119

Area 4

STORAGE VOLUME (kL)							
Rainfall (mm)	Roof Area (m^2)	Demand (L/day)					
		100	200	300	400	500	600
1000	100	14	60				
	150	13	31	90			
	200	11	28	52	120		
	250	10	25	45	75	150	
	300	8	26	42	61	102	180
1500	100	8	24	90			
	150	4	19	36	77		
	200	0	16	30	48	84	180
	250	0	11	25	45	60	94
	300	0	9	23	38	54	72
2000	100	6	20	42	120		
	150	0	16	30	48	84	180
	200	0	11	26	40	64	88
	250	0	10	20	33	50	70
	300	0	0	17	31	40	60
2500	100						
	150						
	200						
	250						
	300						
3000	100		8	15	27	54	114
	150		0	12	18	27	41
	200			0	16	20	30
	250			0	0	20	25
	300				0	0	23

Area 5

Further information

Any licensed plumber or tank manufacturer may be approached for help in installing prefabricated tanks. For tanks cast on site or which are bigger than 2,000 litres, it may be necessary to obtain the advice of a builder or structural engineer.

For tank suppliers - See under 'Tanks and Tank Equipment' in the yellow pages of the telephone directory.

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Queensland Government
Environmental Protection Agency

For more information on WaterWise, phone your local council, water board or WaterWise Queensland.

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