

Rainwater Treatment Guide

Introduction

Rainwater can be a suitable drinking water supply providing the rainwater is clear, has little taste or smell, is free from suspended material, comes from a well-maintained catchment (roof and gutters), and is stored in a clean and vermin proof tank. It is unlikely to cause illness in most users. However, this is not a guarantee of safety as contamination is not always visible.

It is important that rainwater tanks and associated plumbing, together with appropriate water treatment and disinfection systems are correctly selected, installed and regularly maintained in order to protect drinking water quality. Look for tanks, coatings and plumbing materials that have been tested for contact with drinking water to AS/NZS 4020:2005.

Refer to the *NSW Private Water Supply Guidelines* and the enHealth publication *Guidance on the Use of Rainwater Tanks* for more information on rainwater collection, hazards, maintenance and testing.

<http://www.health.nsw.gov.au/environment/water/Documents/NSW-Private-Water-Supply-Guidelines.pdf>

<http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-enhealth-raintank-cnt.htm>

Rainwater Health Risks

Rainwater needs to be free of disease causing microorganisms (bacteria, viruses and protozoa) and harmful levels of chemicals, to ensure a safe drinking water supply. Contamination of collected rainwater with disease causing microorganisms from birds and other animals poses the biggest risk to health.

Rainwater can be disinfected before consumption to remove disease causing microorganisms. However, disinfection does not remove chemicals and other treatment or management processes may be necessary to manage any chemicals that present a risk to health.

Lead may be present in rainwater systems due to leaching from roofing material such as flashing or roofing screw washers. It may also be present in some grades of PVC piping and in older solder and brass fittings. Look for PVC-U pipes and fittings certified to AS/NZS 1477 to ensure they do not present a lead leaching risk. Lead on the roof is best managed by removing the source of lead or painting over it, so that it cannot come in contact with water. Lead, copper or other metals that may leach from plumbing materials are best managed by flushing pipes for several minutes each morning.

Rainwater Treatment Systems

There are several methods for treating rainwater to remove any contaminants that may present a health risk and professional advice should be sought for the design and installation of an appropriate water treatment system. These treatment methods may include:

Filtration to remove particulate matter and some dissolved materials from water. There are many filtration devices available and microorganism and particle removal varies with the filter

type. Water filters should not be necessary to maintain microbial, chemical or physical quality of rainwater if catchments and tanks are well maintained. Some filter systems will require a power supply.

UV disinfection by ultraviolet light irradiation (UV) is effective against most bacteria, viruses and protozoa. UV systems require relatively low maintenance, do not require the addition of chemicals and can include warning alarms to indicate equipment faults. Specialist UV chambers for treating rainwater are designed to provide a dosage of UV light at a given flow rate. UV systems are most effective when the water is clear and free of particles. Rainwater supplies may need to be filtered to ensure effective UV treatment. UV treatment does not remove chemicals from water. UV systems will require a power supply. Water that has been disinfected using UV should be used straight away, not stored in tanks.

Chlorine disinfection is a common form of disinfection that is effective against harmful bacteria, viruses and *Giardia*, but has limited effect against *Cryptosporidium*. See the *NSW Private Water Supply Guidelines* page 25 for guidance on manually chlorinating a rainwater tank.

Filtration Treatment Systems Include

Polypropylene & ceramic cartridge type filters can effectively treat water by removing sediment and bacteria, but will not remove viruses

Activated carbon filters are most effective in removing and/or reducing chemicals such as iron and hydrogen sulphide, objectionable tastes, odours and colour, but will not remove bacteria or viruses. NSF/ANSI Standard 42 refers to the removal of specific aesthetic or non-health-related contaminants (chlorine, taste, odour and particulates)

Micro/Ultra filtration membrane filters (0.1 - 0.01 micron) can effectively treat water by removing sediment and bacteria. Ultrafiltration membrane filters may also remove viruses. Installations should include a pre-filtration stage of 30 micron rating, an automatic filter backwash cleaning function and a suitable disposal method for the small amount of dirty backwash water from the filters. NSF/ANSI Standard 53 refers to the removal of specific health related contaminants

Reverse osmosis filters (0.001 micron) are the most sophisticated and are extremely efficient and effective for the removal of microorganisms and most residual chemicals from water. The filters produce a constant waste stream when operating, and usually need to be connected to a drain and power supply. Installations should include a pre-filtration stage of 5 micron rating, an automatic filter backwash cleaning function, and suitable disposal method for the waste stream and small amount of dirty backwash water from the filters. NSF/ANSI Standard 58 refers to the removal of total dissolved solids and other optional reduction claims.

Checklist for selection and purchasing a filtration system

- Determine the volume of water to be treated and ensure the filtration equipment has the capacity (e.g. litres/hour) to treat all the water needed. The smaller the micron size, the finer the filtration, the greater the reduction of the flow rate and available pressure through the filter, resulting in a higher frequency of maintenance

- Determine the type of filter required for any dirt or debris and/or chemicals of health concern present in the rainwater
- Determine any pre-filtration screening requirements, designed to remove larger solid particles to prevent fouling or clogging of the filter
- Ensure that the filtration system carries the WaterMark or Plumbing Safety Type Test Mark and it complies with at least one of the following standards, ANSI/NSF Standard 53 or AS/NZS4348. Filters being installed to remove a specific contaminant should have been tested to demonstrate their effectiveness against that contaminant
- Where the filtration equipment may be subject to normal water mains pressure (i.e. greater than 150 kPa) then the filtration equipment must comply with AS/NZS 3497.

Checklist for selection and purchasing a UV disinfection system

- Determine the volume of water to be treated and ensure the equipment has the capacity (e.g. litres/hour) to treat all the water needed
- It is equipped with a pre-filter to remove any dirt and debris that can either absorb or scatter the UV light. Generally a 20 micron filter is installed between the pump and the UV unit
- It is equipped with a second stage filter (1 micron) before the UV unit to reduce parasitic cysts such as *Cryptosporidium* and *Giardia* that are more resistant to UV light than bacteria and viruses
- It has a built in light sensor that can monitor the UV intensity, connected to an alarm system to alert the user in case of low UV level
- It has a safety control system that can shut off the water supply in case of a low UV level alarm or loss of power
- It is connected to a constant power supply of sufficient capacity to suit the systemThe UV disinfection system carries the WaterMark or Plumbing Safety Type Test Mark and at least one of the following standards, ANSI/NSF Standard 55 Class A systems (40 mJ/cm²), AS/NZS 3497 or AS/NZS 4348 and treatment classification level.

Checklist for selection and purchasing a chlorine disinfection system

- Determine the volume of water to be treated and ensure the equipment has the capacity (e.g. litres/hour) to treat all the water needed
- It is equipped with a pre-filter to remove any iron, manganese and other dirt and debris that can either absorb and/or deplete chlorine residual levels. Water for chlorine disinfection should have a turbidity of <1 NTU.
- Adequate post chlorine dosing detention time is available within the water supply system, typically at least 30 minutes is required to complete the disinfection process and ensure a minimum free residual chlorine level of 0.5 mg/L
- Includes a residual chlorine test kit to be used for regular monitoring (e.g. daily or weekly) of residual chlorine levels in the supplied drinking water
- The chlorine disinfection system carries the WaterMark or Plumbing Safety Type Test Mark and AS/NZS4348.