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# ROOF WATER IN URBAN AREAS

## ADVICE ON THE SAFE NON-POTABLE USE OF ROOF COLLECTED WATER IN URBAN AREAS

**I**ncreasing numbers of people in urban areas collect roof water for use on residential properties. Some territorial local authorities within the Auckland region encourage the on-site re-use of roof collected water as a means of reducing urban runoff. The Auckland Regional Public Health Service (ARPHS) has prepared the following article to assist homeowners to minimise the public health risks associated with the collection, storage and re-use of roof water in urban environments.

ARPHS supports measures to reduce stormwater runoff, but recommends caution in the collection and re-use of roof water in urban environments. We do not recommend using roof collected rainwater (roof water) in urban environments for drinking water purposes unless the water is adequately treated and monitored. A recent study in the Auckland region (Simmons et al. 2001) has shown that roof collected water in the Auckland region is of poor microbiological and physico-chemical quality and often does not comply with the New Zealand Drinking Water Standards 2000 (Ministry of Health 2000). Untreated roof collected rainwater should only be used for garden watering, washing cars and hosing paths. Roof collected rainwater could be used for flushing toilets as long as there are appropriate measures in place to prevent cross contamination of the main water supply.

### LEGAL REQUIREMENTS

The installation of a roof water tank will need to comply with local by-laws and in many cases will require a building consent. Plumbing work may require consent from your local territorial authority. The installation of a roof water tank must comply with the Building Regulations 1992 which states the following:

*The First Schedule Clause G12 Water Supplies requires that*

*piped water supplies intended for human consumption, food preparation, utensil washing or oral hygiene shall be potable and;*

*piped water supply and outlets provided with non-potable water shall be clearly identified.*

and:

*water supply systems shall be installed in a manner which*

*a) avoids the likelihood of potable water contamination.*

Potable water (i.e. water suitable for drinking) is defined in the New Zealand Drinking Water Standards 2000 (DWSNZ) as "drinking water which does not contain any determinants which exceed the maximum acceptable values given in the DWSNZ".

Water authorities and suppliers in New Zealand do not allow roof water systems to be plumbed into houses connected to a mains water supply and/or require the use of backflow prevention devices to stop roof collected rainwater from domestic tanks entering the reticulated potable water supply. The local water supplier and council should be consulted prior to the installation of a roof water tank.

### MICROBIOLOGICAL HAZARDS

The biological quality of roof water in New Zealand often does not meet the drinking water standards (Ministry of Health 2001). Potential microbiological contaminants in roof water include *E. coli* 0157, *Cryptosporidium*, *Campylobacter*, *Giardia* and *Salmonella*. *Salmonella* and *Campylobacter* bacteria are increasingly detected in roof water supplies in the Auckland region. Sources of microbiological hazards in roof water include faecal material from animals (possums, birds and rats), soil and leaves collecting in gutters, and dead animals and insects in the tank or guttering (Cunliffe 1998).

### CHEMICAL HAZARDS

Chemical contaminants commonly encountered in roof water supplies include copper, zinc, lead and arsenic. Copper pipes, gutters and flashings can be a source of copper and zinc may leach out of some roofing materials (Gadd and Kennedy 2001). Roofing paints can be a source of metals entering roof water tanks, for example some older roof paints may contain lead, chromium and cadmium

(Ministry of Health 2001). Sources of airborne contaminants (e.g. polycyclic aromatic hydrocarbons, combustion products and dust) include emissions from vehicles, industrial emissions and domestic fires. Pesticide treated roofing material and spray drift can be a source of pesticide contamination in roof collected water supplies (Cunliffe 1998, Gadd and Kennedy 2001). Reusing old containers for the collection and storage of roof water may also result in chemical contamination of roof water.

Arsenic contamination can occur if roof water comes into contact with treated timber. The Auckland study (Simmons et al. 2001) found that 7% (1 out of 14) of roof water supplies with exposed treated timber forming part of the water collection system, exceeded the drinking water maximum acceptable value (MAV) for arsenic. The ARPHS has also recently investigated a case involving elevated levels of arsenic in a roof water supply: in this case the most likely source of the arsenic was from burning treated timber in a domestic fire and contaminating the roof of the house. Sources of lead in roof water tanks include lead paint and lead paint removal, lead flashings on roofs, soldering in guttering and/or the water tank and smoke from burning wood painted with lead based paint (Ministry of Health 2001, Cunliffe 1998).

## PHYSICAL HAZARDS

Large volumes of water are very heavy e.g. 1000 litres of water weighs 1000 kg (1 tonne). Tanks need to be installed securely so that they are unable to move or collapse. Roof water tanks should be securely covered to prevent access by children and must not pose a drowning risk. Open containers should not be used for collecting and storing roof water.

Overflows from the roof water tank should be collected and diverted into a stormwater drain. Excess roof water should not be allowed to pool or to run onto either the property or neighbouring properties. It is important that roof water is not allowed to pool underneath buildings or around foundations (Cunliffe 1998).

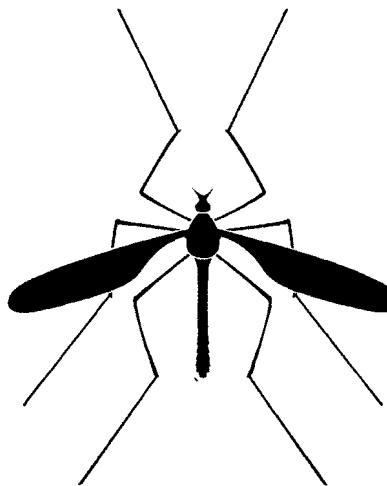
## MOSQUITOES

Roof water tanks can provide excellent habitats for freshwater container breeder mosquitoes. The Australian National Environmental Health Forum (Cunliffe 1998)

recommends that the inlets and overflow pipes be covered with closely fitting removable insect-proof screens. The screens should be cleaned regularly. Mosquito larvae in roof water tanks can be killed by adding a small volume of edible oil (e.g. canola) or household bleach. (Check with the manufacturer of the tank before adding chemicals as they may damage tank linings).

## RECOMMENDED RISK MANAGEMENT PRACTICES

This information is intended for property owners in urban areas. People relying on roof water supplies in rural areas are advised to contact their local council or public health service for advice appropriate to their situation.



- Maintain any roof collected water system on a regular basis.
- Install a protective screen on the inlet, outlet and overflow pipes to prevent insects, birds and animals from getting into the tank.
- Outlets from the roof water tank need to be clearly labelled "not suitable for drinking". This is particularly important for tenanted properties.
- Label any pipes containing roof water clearly so that they can be easily distinguished from pipes containing mains supply water during any plumbing work. This will help to prevent cross-connections.
- Ensure that children and visitors know that the roof collected rain water supply is not suitable for drinking e.g. teach children not to drink from outside taps or hoses.
- Make sure that water from the overflow

pipe does not pond or flow onto your own or neighbouring properties, or flow under house foundations.

- Install an approved backflow prevention device if the roof water supply is to be plumbed into a house for flushing toilets. This is a legal requirement.

• Do not use untreated roof collected water for drinking. In an emergency, roof collected water can be used for drinking if there is no other source of drinking water but must be boiled or disinfected. Boiling water will destroy microbiological contamination, however roof collected water may still be chemically unsafe to drink. If no power is available, add 5 drops of household bleach e.g. Janola, per litre of water. Do not drink for at least 30 minutes after disinfecting.

- Wash fruit and vegetables in mains supply water.
- If roof water is to be used in the washing machine, use a dedicated tap to prevent other uses of this water.
- Use mains supply water for swimming and paddling pools and if children are playing under sprinklers.

## ACKNOWLEDGEMENTS

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## REFERENCES AND FURTHER INFORMATION

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Gadd J and Kennedy P (2001) House roof runoff: is it as clean as we think! 2nd South Pacific Stormwater Conference 2001. <http://www.kmn.co.nz.pubs1.htm>

Ministry of Health (2000) *New Zealand Drinking Water Standards 2000*

Ministry of Health (2001) *Household Water Supplies*. Ministry of Health, Wellington.

Simmons G., Hope V., Lewis, G., Whitmore J., and Gao, W (2001) Contamination of potable roof-collected rainwater in Auckland, New Zealand. *Water Research* 35(6) 1518-1524. 

## WATER PROGRAMME OF ACTION

We drink it, play in it and use it in a myriad of ways. Water supports important ecosystems and industries such as agriculture and energy. We have strong cultural associations with water and it is of fundamental importance to tangata whenua. Water is precious and it is a finite resource. It is important that we manage water effectively, so that it meets our needs now and in the future.

The Water Programme of Action is an opportunity for a fundamental review of water management. We are not bound by the current management systems or existing legislation. The two year programme covers issues surrounding water allocation and use, and water quality. There is also a workstream around identifying the potential water bodies of national importance. The specific projects in the Water Programme of Action are outlined on

(<http://www.mfe.govt.nz/publications/wiwater-programme-nov03/index.html>).

The programme is being jointly led by Ministry of Agriculture and Forestry and Ministry for the Environment. It involves collaboration through project teams, and at senior management levels, aiming to produce the best solutions for all who have an interest in water. For example, regional councils are the primary water managers in New Zealand and the programme will not succeed without their effective involvement.

Maori and Stakeholder Reference Groups have been established to contribute to the policy development process and advise on consultation processes. Both groups have had their first meeting.

### PROGRAMME GOALS

At the end of the programme we will have decided on:

- the changes to the management framework

- the tools and resources to be developed
- the timeframes for the work to be completed.

The result will be an improved water management system where regional councils have the mandate and tools to be strategic in their planning, and the national interest can be reflected in their decision making.

There are no predetermined specific tools or changes ... - all options are on the table. Through the policy development process, the scope of alternatives will reduce to a set of options that are suitable for water management in New Zealand.

A consultation process is planned for September/October 2004 to identify the key issues around water management and potential directions for the way forward.

For updates on the *Water Programme of Action* contact: Elizabeth Eastmure, email: elizabeth.eastmure@mfe.govt.nz

## MICROBIOLOGICAL HEALTH RISKS OF ROOF-COLLECTED RAIN WATER

A paper on the Microbiological Health Risks of Roof-Collected Rain Water was presented at a New Zealand Institute of Environmental Health Conference in Napier in March 2004 by researchers from Massey University at Wellington. The paper reviewed a number of national and international studies on the microbiology of roof-collected rainwater and focused especially on the following topics:

- Maintenance of rainwater catchment systems.
- Bacterial growth in rainwater storage tanks.
- Faecal contamination of stored rainwater.
- Bacteriological standards for rainwater quality.
- Bacteriological compliance surveys of roof-collected rainwater.
- Pathogens isolated in roof-collected rainwater.
- Disease outbreaks linked to

contaminated rainwater supplies.

- Rainwater consumption and health.

The surveys described in the paper highlight the fact that many rainwater supplies in New Zealand are inappropriately designed and/or managed and suggest that information regarding safe rainwater collection and storage may not be getting through to the users, in spite of a number of excellent public information brochures, guides and books on roof-collected rainwater systems being available from the Ministry of Health.

The health risks associated with non-compliant roof-collected rainwater consumption are not well defined or quantified because of many confounding factors associated with rainwater use. Assessing the microbiological health risks of using stored rainwater for consumption requires extensive, complex data collection and analysis, and results may vary from one locality or region to another. However, risk assessment may enable evidence-based decision making to be used for developing appropriate rainwater quality standards and also

for the accurate communication of any health risks to the consumers of the rainwater so that the risks can be managed.

If it is established that a roof-collected rainwater catchment system is a serious risk to health, then before any public health control measures are implemented, it should first be determined if the proposed control measures will be effective. Changing the behaviour of roof-collected rainwater consumers is not always easy. Any expected behavioural changes by the consumers will only be effective if it usually involves very little extra effort and cost to them and if the public health messages to them are forthright and based on sound evidence.

Copies of the whole paper *Microbiological Health Risks of Roof-Collected Rain Water - A Review* by S.E. Abbott, B.P. Caughey and S.J. Bell, Institute of Food Nutrition & Human Health, Massey University, Wellington, New Zealand can be obtained by emailing: S.E.Abbott@massey.ac.nz