

BOWEN ISLAND MUNICIPALITY

BYLAW NO. 188, 2006

A Bylaw to amend the Bowen Island Municipality Building Bylaw No. 65, 2002

WHEREAS Council has adopted “Bowen Island Municipality Building Bylaw No. 65, 2002”;

AND WHEREAS, Council deems it necessary to amend the “Bowen Island Municipality Building Bylaw No. 65, 2002”

THEREFORE be it resolved that the Council for Bowen Island Municipality in open meeting assembled enacts as follows:

1. This Bylaw may be cited for all purposes as the “Bowen Island Municipality Building Bylaw No. 65, 2002, Amendment Bylaw No. 188, 2006.”
2. “Bowen Island Municipality Building Bylaw No. 65, 2002” is amended by adding Appendix “I”, which is attached to this Bylaw.
3. Section 19 “Retaining Structures” is deleted and replaced with the following:

19. Retaining Structures and Swimming Pools

19.1 Retaining Structures

19.1.1 A **registered professional** shall undertake the design and conduct **field reviews** of the construction of a retaining structure greater than 1.5 meter in height. Sealed copies of the design plan and **field review** reports prepared by the **registered professional** for all retaining structures greater than 1.5 meter in height shall be submitted to a **building official** prior to acceptance of the works.

19.2 Swimming Pools

19.2.1 Every swimming pool that when finished will contain water exceeding at any point a depth of 450mm and has an area in excess of 14 square meter, shall

19.2.1.1 Be constructed or be painted with material light in colour and be surrounded by a nonslip surface apron of a minimum width of 1.2m, draining away from pool edge.

- 19.2.1.2 Be so constructed as to offer a complete view of the pool from any point on its perimeter for the purposes of supervision.
- 19.2.1.3 Be so constructed that outflowing water is not returnable to the pool without adequate filtering to maintain absolute visual clarity in the water.
- 19.2.1.4 All swimming pools that contain water of a depth exceeding 450mm and an area exceeding 14 square meter, presently constructed or to be constructed in the future, shall be enclosed by a fence or barricade of minimum height of 1.2m; such fence or barricade shall be constructed so as to deny access to children and animals to the pool area and shall have a self-closing and self-latching gate or gates of similar height and construction.

READ A FIRST this 10th day of July, 2006.

READ A SECOND TIME this 10th day of July, 2006

READ A THIRD TIME this 10th day of July, 2006

RECONSIDERED AND FINALLY ADOPTED this 24th day of July, 2006.

(Original signed) _____
Bob Turner
Mayor

(Original signed) _____
Isabell Hadford
Clerk

Certified to be a true and correct copy of the "Bowen Island Municipality Building Bylaw No. 65, 2002, Amendment Bylaw No. 188, 2006" adopted by the Council of Bowen Island Municipality this 24th day of July, 2006.

(Original signed) _____
Isabell Hadford
Clerk

BOWEN ISLAND MUNICIPALITY
BYLAW NO. 188, 2006
APPENDIX "I"

See Appendix as attached entitled "*Rainwater Harvesting on the Gulf Islands – Guide for Regulating the Installation of Rainwater Harvesting Systems – Potable and Non-potable Uses*" prepared for the Islands Trust Fund by Dick F. Stubbs.

Bowen Island Municipal Council reviewed the proposed Guide at their July 10, 2006 Council meeting and intends that it be used as a **guide** for those who are doing building construction on Bowen Island. Council recognizes that the Guide may not apply in all situations but recommends that builders follow and try to incorporate it as closely as possible.



RAINWATER HARVESTING ON THE GULF ISLANDS **Guide** for Regulating the Installation of Rainwater Harvesting Systems – Potable and Non-potable Uses

Prepared for the Islands Trust Fund

by

Dick F. Stubbs

First Edition

2006 Salt Spring Island, British Columbia

DISCLAIMER The material presented hereunder is based on best professional judgment, and intended to provide "Guidelines" for the installation and use of Rainwater Harvesting Systems (RWHS). The writer assumes no warranties or liability with regard to the use of any of the following procedures or methods. RWHS systems must conform to all applicable Federal, Provincial and local regulations. For further information, contact your local building inspection office and local health authorities.

This project was generously funded by:

Vancity/Real Estate Foundation of British Columbia Green Building Grant Program, <http://www.realestatefoundation.com>

Capital Regional District, <http://www.crd.bc.ca>

Victoria Foundation, <http://www.victoriafoundation.bc.ca>

Rainwater Connection, <http://www.rainwaterconnection.com>

The Salt Spring Island Foundation

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Preface

This document has been written to assist designers and regulators in local government with the development and application of appropriate practices when addressing the installation of a rainwater harvesting system for potable and non-potable use in single family dwellings. The writer would like to thank the many sources that provided background materials and information, not to mention motivation. There are many jurisdictions that, by necessity, have formally reviewed the use of rainwater in recent years and they should be recognized for providing valuable assistance (see Appendix B on page 14). It was then a matter of reviewing the practices and issues throughout the Gulf Islands and south western British Columbia, over the past number of years, in an effort to appreciate the extent of use, regulatory concern and obstacles to installation (physical and political).

It should be recognized that this is a work in progress! Comments to the writer are welcome.

Present Practices

While local governments are beginning to encourage a number of water conservation programs, the potential of rainwater collection has not been given a high profile in British Columbia. The nature of rainwater harvesting encourages personal responsibility, resulting in conservation of a valuable and diminishing resource. The immediate result of a rainwater collection installation, even if it is only a rain barrel, is that the homeowner becomes a conserver. He/she is now connected to his water supply ... where it is coming from and where it is going.

Rainwater harvesting systems for single family dwellings are being installed in many rural areas when other "traditional" sources are not available or are viewed as being too expensive by the homeowner. Increasingly, there is also the concern of groundwater contamination and in many coastal areas, salt water intrusion. In some urban areas, the use of rainwater, as an alternate source, is being encouraged for non-potable purposes, primarily toilet flushing, water features, and irrigation in the hope of lessening pressure on municipal infrastructure.

Most of the installations in single family dwellings are not reviewed by a regulatory process. There are few regulations regarding the collection of rainwater for private single family dwellings. The BC Building Code does not clearly address the "source" of the water that is supplied by an individual to their "private water supply system". It is not common to "inspect" private water sources beyond confirming quantity and quality at the time the home is built. While the Plumbing section of the BC Building Code makes reference to interconnection between different sources of supply and non-potable water systems, the rules are less than clear and the local inspector, if asked, is often reluctant to approve the installation of a rainwater harvesting system. Most (up to 80%) of the installations are completed by homeowners and there are no doubt some non-potable systems being utilized for potable purposes. The degree of monitoring and maintenance by the homeowner varies. A review of a water source is usually not required until it is utilized as part of a water system (i.e. as defined in the Drinking Water Protection Act) or for various commercial, institutional or industrial applications.

The recent demonstration project by the Islands Trust Fund at the Ruby Alton Nature Reserve on Salt Spring Island, recognized the need for additional information in an effort to ensure that rainwater harvesting systems are installed in a proper manner. The Islands Trust Fund is also responsible for creating a number of related publications such as: Frequently Asked Questions, Maintenance Manuals and the Rainwater Harvesting Guide, (available on the Islands Trust website), which will be of great assistance to those contemplating a rainwater harvesting system.

Future

It is hoped that rainwater harvesting systems gain acceptance from a wider audience, beyond single family dwellings with private water sources. That said, it will mean that the regulatory requirements must be updated in a clear fashion so that these installations can meet the requirements of an approval process. Local health authorities appear to recognize that rainwater could be an acceptable source for potable water, but until they receive an application are not sure of the exact nature of the approval process. It would be desirable to research the issues and explore the obstacles to approval, so that regulators are prepared for future applications.

In the process of drafting the Rainwater Harvesting Guide, a number of issues became evident which will need to be addressed;

1. The need for testing rainwater quality in localized areas. Rainwater is generally extremely pure but there are a number of human activities which could introduce contamination; wood burning appliances, pulp mills, cement plants, other industrial activities. The areas where it may not be appropriate for rainwater harvesting should be identified.
2. Maintaining water quality is of great concern to water purveyors. Interconnection issues between water sources, potable and non-potable, public and private, are already recognized as problematic. The water source may not be the problem but how you handle the water prior to use can be. Water treatment has generally not been something done by the homeowner. Would there be a need for a monitoring program to ensure that standards remain high? Would water treatment be only done by properly trained technicians? How do we label non-potable piping so that it is not mistaken for potable piping?
3. There is a reluctance to move away from common practice and think about better ways of doing things. There is evident need for education and training for those involved at the supply, installation, and regulatory levels.
4. Rainwater collection systems involve many different components, many of which have not been formally tested or approved for various applications. While it is hoped that their use and installation has been supervised by experienced technicians, this is not always true. There is a concern that potable water systems should only have approved components but in many cases there is not an approval process in place.
5. It must be recognized that liability is an issue. The use of rainwater is unlikely to be approved by regulators if there is any thought that others could be adversely affected and as a result local authorities held responsible.

Rainwater will continue to be utilized for private single family dwellings and engineered non-potable applications as we explore the possibilities of this resource. There is no doubt that rainwater, properly treated, can technically meet and exceed the requirements for potable water. The concern is how we ensure that the standard is met on a continuing basis for a wider audience. Water quality is a fundamental issue.

Who will catch the rain? Let me show you how!

Dick F. Stubbs
March 2006
Telephone 250-537-4784
Email dick.stubbs@gmail.com

1.0 Overview

Rainwater harvesting systems for single family dwellings in British Columbia are subject to the same basic regulatory framework as individual well systems. The British Columbia Building Code would appear to include rainwater harvesting systems in the category of private water supply systems, and the Health Act establishes the authority for inspection and enforcement of safe operation of private water supply systems. As with private wells, rainwater harvesting systems serving single-family dwellings fall outside the scope of the Drinking Water Protection Act. These guidelines are intended to assist designers and regulators in developing rainwater harvesting systems that provide reliable potable or non-potable water supply for single family dwellings in British Columbia.

A rainwater harvesting system begins at the point of collection and terminates at the *water distribution system*. The parts of a rainwater harvesting system include:

1. Collection System
2. Conveyance Piping
3. Cistern
4. Pressure System
5. Treatment

2.0 Terms

Words in *italics* are defined in the BC Building Code. In addition to the definitions in the Code, the following terms apply to rainwater harvesting systems in this Guideline:

ALTERNATE SUPPLY means the piping arranged and protected from contamination by an approved *backflow preventer* or approved air gap, to provide an alternate means of filling a cistern.

CISTERN means the central storage component of the rainwater harvesting system.

CODE means the British Columbia Building Code.

COLLECTION SYSTEM means the roof, guttering, downspouts and catchment piping that transports rainwater from the roof to the conveyance piping.

CONVEYANCE PIPING means the piping that conveys rainwater from a collection system to a cistern; including debris excluders, roof washers or first flush diverters.

CSA means the Canadian Standards Association.

DISINFECTION means a system which treats water to remove or render inactive pathogens so that the water is suitable for potable use.

DEBRIS EXCLUDER means a device installed on the gutter or downspout system to prevent the accumulation of leaves, needles, or other debris in the system.

FILTRATION means a system using mechanical means to remove sediment and other contaminants.

FIRST FLUSH DIVERTER means a device used to automatically divert the initial rainfall, during a rain event, away from the cistern (.5 mm minimum).

HARVESTED WATER means rainwater that has been collected, stored and treated for any purpose, which may include *potable or non-potable* use.

NSF means the National Sanitary Foundation.

POTABLE means water that is safe to drink and fit for domestic purposes without further treatment, as defined by the British Columbia Drinking Water Protection Act.

PUMP OR PRESSURE SYSTEM means the mechanical device necessary to distribute the harvested rainwater from the cistern to the designated fixtures. Pumps may also be used to deliver rainwater from a collection point to a cistern. See "Surge Pump".

RAINWATER HARVESTING SYSTEM means a roof, guttering system, conveyance piping, cistern(s), fittings, pumps and other plumbing appurtenances required for and/or used to harvest rainwater. In the Code, this is defined as a type of *private water supply system*.

RETURN ELBOW means a section of pipe with a 180-degree bend.

ROOF DRAINAGE SYSTEM – See *Collection System*.

ROOF SURFACE means the collection surface that rainwater falls on.

ROOF WASHER means a device to mechanically remove sediment and debris from a roof surface before entry into the cistern(s).

SCREEN means corrosion resistant wire or other approved mesh having openings in determined sizes.

SUN BARRIER means a structure erected specifically to shelter a cistern from the direct rays of the sun.

SURGE PUMP means a mechanical device to transfer collected water from downspouts to remote cisterns.

TREATMENT means filtration, and disinfection where harvested rainwater is used for potable purposes

VECTOR means an organism capable of delivering disease, ie mosquito.

WET SYSTEM means a system where the piping between the downspout(s) and the cistern holds water after the rainfall stops.

WATER SYSTEM means the water distribution piping in a building, as defined in the Code.

3.0 Scope

These guidelines are intended primarily for use by designers, inspectors, and local government agencies interested in establishing policy related to rainwater harvesting. They may also be a valuable resource to homeowners considering constructing a system. These guidelines are generally applicable to British Columbia, and specifically draw upon local experience in the Gulf Islands.

These guidelines apply strictly to single family dwellings. Rainwater harvesting systems must be appropriately configured for each individual application. The required water quality for the end use(s) of harvested rainwater is an important consideration in the design, installation and maintenance of a rainwater harvesting system. Local climate, dwelling size and use, landscape plantings, and fixtures and appliances in the dwelling all influence the sizing system components.

These guidelines apply to both potable and non-potable rainwater harvesting systems. A rainwater harvesting system is an acceptable source of potable water for a single family dwelling in British Columbia.

Rainwater harvesting is also viable for other applications. Although beyond the scope of these guidelines, rainwater may be used for a variety of purposes in multifamily, commercial, institutional or industrial facilities. Such applications require the approval of the local health authority.

4.0 General Provisions

- 4.1 All components of a Rainwater Harvesting system must comply with Code.
- 4.2 To ensure proper system performance, any applicable manufacturer's installation and maintenance instructions should be followed. All installations should be designed, constructed and installed to conform to good engineering practice.
- 4.3 Engineered systems should be installed as designed in the plans and specifications supplied by the Engineer of Record.
- 4.4 Harvested rainwater may be used for any purpose within a single-family residence.
- 4.5 These guidelines apply only to rainwater harvested from roof surfaces.
- 4.6 A rainwater harvesting system shall not be interconnected with any other source of water except where an approved cross connection control device has been installed in accordance with CSA B64.10.
- 4.7 Non-potable water systems should never be interconnected with potable water systems. Non-potable piping should be clearly labeled to avoid the possibility of future interconnections.

5.0 Permits and Inspection

- 5.1 The following permits are required for the installation of a rainwater harvesting system:
 - 5.1.1. A plumbing permit for the rainwater harvesting system. Contact local Building Inspection office.
 - 5.1.2. An electrical permit for the pump or other electrical controls. Contact British Columbia Safety Authority.
 - 5.1.3. A building permit, where cistern footings, foundations, enclosures and roof structure are included in the system construction. Contact local Building Inspection office.
- 5.2. Grading and erosion control permits may be necessary for system construction. Contact local Building Inspection office.
- 5.3 In some jurisdictions, the local Building Inspection office (municipality or electoral area office) may impose specific requirements or restrictions regarding the installation of rainwater harvesting systems. Inspections may be required according to local Bylaws.
- 5.4 Permit application. The following information may be required as part of a permit application for a rainwater harvesting system:
 - 5.4.1. Site or plot plan, including site elevations.
 - 5.4.2. A water budget (see Appendix A) consisting of:
 - a. System demand.
 - b. Potential production, based on 0.52 gallons/square foot/inch of precipitation, considering the average rainfall for the system location and the area of the roof. The amount, if any, proposed from an alternate supply should also be included.
 - 5.4.3 Isometric drawing of rainwater harvesting system (including piping and section diagrams) to include sizing and dimensions.

- 5.4.4. Specifications and manufacturer's installation instructions if available.
- 5.4.5. Engineering. Some installations, including but not limited to the following, may require structural design by a professional engineer:
 - a. Cisterns located within or on top of a building structure.
 - b. Cisterns located on a sloping site or an unstable site (as determined by the building inspector).
 - c. Concrete cisterns that are cast in place.

Information in addition to that listed above may be necessary in some instances. The size and complexity of the building, site and system will determine the necessity for additional information.

6.0 Zoning

Rainwater harvesting systems must comply with the applicable provisions of a local Land Use Bylaw. This requirement generally pertains to siting and setbacks and may include a design review.

7.0 Requirements for System Components

7.1 Collection System

7.1.1 Roof

The size of the roof (i.e. its area in plan), local rainfall patterns, and the system design determine the amount of water available for harvesting.

The quality of the water collected depends on the type of roofing, climatic conditions and the local environment. The most common material for potable end uses is painted galvanized metal; slate, terracotta or concrete tiles are also used. Asphalt shingles are sometimes used but are harder to keep clean, and are not recommended for potable use. Shingles that contain moss inhibitors are not suitable for *potable* use. Other types of roofing are generally only used for non-potable systems. There are approved surface coatings for roofs but they are expensive and have a short life span. Lead flashings or lead plumbing vents are not suitable for potable use.

7.1.2 Gutter System

The most common gutter and downspout materials are aluminum and PVC (or vinyl); both of which are suitable for potable end uses.

- a. The size of the gutters and the rainwater leaders will be calculated as required in the Code
- b. The installation of the gutters must ensure that water is not directed into the building during an extreme rainfall.
- c. Gutters should be installed with a continuous downward slope (minimum 1:500) to encourage good drainage. Standing water gives a place for insects and small animals to congregate, it also encourages decay of accumulated organic materials.
- d. Gutter outlets, at the downspout should be installed so that debris will not accumulate. This is a common problem area and should be clarified with the gutter installer prior to installation.

Trees should be trimmed clear of the roof area wherever possible to minimize debris accumulation. Screens or other devices may be installed on gutters. All screens and gutters need to be cleaned regularly.

7.2 Conveyance Piping

7.2.1 There are three types of conveyance piping systems;

1. Gravity Flow System. A dry system where all conveyance piping slopes downward to the cistern. (This is the simplest and least expensive conveyance system to construct and maintain.)

2. Gravity Head System. A closed wet system in which water flows through full pipes from the gutter or downspout to a cistern that is located at a similar elevation to the collection system. Water remains in the pipes between rainfall events.

3. Surge Pump System. The rainwater flows by gravity to a small tank where a non oil bearing sump pump "transfers" the water to a cistern that is located at a higher elevation than the collection system. (This is the most complex and expensive conveyance system to construct and maintain.)

All conveyance systems should include means to limit the amount of leaves, needles, berries, roof residue, sediment and other organic material entering the cistern.

7.2.2 All downspouts should be fitted with debris excluders or debris traps that are easily maintained. These devices are typically installed at downspout outlets, before rainwater enters the closed piping system. All piping downstream of this point should be CSA approved where the system is used for potable purposes.

7.2.3. Gravity head systems are not recommended. All piping that holds water continuously must include screens or other means to prohibit the entry of vectors, rodents, frogs and lizards.

7.2.4. All collected rainwater should pass through a first flush diverter that automatically collects and diverts at least the first 0.02 inches (0.5mm) of rain at the beginning of a rainfall event. The quantity of water diverted is 10.4 gal for 1000 ft of catchment area (50 litres/100m). The diverted water should be discharged to an acceptable location such as a rock pit.

7.2.5. Prior to entering the cistern, all collected rainwater should pass through an easily maintained screen filter that limits the entry of small debris.

Debris excluders, first flush diverters and filter components are available in many configurations from a number of suppliers. Some are combined and commonly referred to as roof washers.

At certain times of the year, the collection system may have to be diverted away from the cistern due to high pollen levels, which rapidly clog screens. Increasing the overall size (i.e. surface area) of the screen may alleviate this problem.

7.3 Storage Systems – Cisterns and Tanks

7.3.1 Storage is the biggest and most expensive part of a Rainwater Harvesting System. For the purpose of these guidelines, a cistern is considered to be a permanently installed water storage tank, which does not include rain barrels.

The size of cistern required for a rainwater harvesting system depends on roof area, rainfall patterns, length of dry season, losses in collection and storage, and indoor and outdoor water demands. Cistern sizing procedures are beyond the scope of these guidelines.

Cisterns may be constructed of polyethylene, coated or galvanized steel, concrete, fiberglass, ferrocement, wood or brick. The most commonly used materials are polyethylene, galvanized steel and concrete. It is also common to utilize liners that meet the NSF 61 standard. Size, aesthetics, service life and cost are the primary factors that determine cistern type.

- 7.3.2. Cisterns should be approved for their intended use. Factory built tanks for potable water should have CSA or NSF approval. All factory built tanks should be installed according to the manufacturer's instructions. Foundations must be capable of supporting the cistern when it is full. Cast in place concrete cisterns require design by a professional engineer.
- 7.3.3. Cisterns should be capable of being filled from an alternative source.
- 7.3.4. Cisterns should be sized for their intended use. In rural locations, it is recommended that the sizing calculations include water for fire fighting and other emergencies. A firefighting connection of size and type specified by the local fire department should be provided at the cistern.
- 7.3.5. Location. Cisterns may be located above or below ground. Some installations, such as those on steeply sloping sites or with high groundwater table, require design by a professional engineer.
- 7.3.6. Inlets, Outlets, and Openings. All openings must be adequately protected to prevent the entry of vectors, rodents or other animals, groundwater, or any other source of contamination.
- 7.3.7. Cisterns must be opaque and limit the entry of sunlight. Fiberglass and polyethylene tanks may need to be painted or located within a building.
- 7.3.8. All cisterns must have access for inspection and cleaning. All openings must be protected from unintentional entry. Manhole covers must be fitted, and fastened or locked closed. Where an opening is provided for access, the opening should be marked, "DANGER – CONFINED SPACE".
- 7.3.9. All cisterns must have an overflow pipe, equal to or larger than the intake pipe, near the top of the cistern. This outlet must be fitted with a screen with openings no larger than 0.25" and lead to an appropriate location that is suitably protected from erosion.

7.4 Pressure System

The pressure system ensures that the collected rainwater is distributed throughout the plumbing system to all fixtures at an adequate pressure and flow rate. The pressure system typically consists of a standard jet pump and pressure tank, and pressure-activated electrical controls to automatically operate the pump on demand. Pressure system sizing and selection is beyond the scope of these guidelines.

- 7.4.1. The pump and all related components should be approved for their intended use. Non oil bearing sump pumps can be used for transferring water prior to treatment.
- 7.4.2. The pump should be capable of delivering a minimum of 25 psi (172kpa) residual pressure at the highest outlet served. If the pressure is capable of exceeding 80 psi (550 kpa) a pressure relief valve should be installed.

7.5 Treatment System – Particle Filtration and Disinfection

Rainwater should be filtered and disinfected for potable purposes including drinking, cooking,

hand washing, and bathing. Filtration may also be required for some non-potable end uses, such as drip irrigation, although disinfection is not required for non-potable end uses.

Raw, screened rainwater may be used for irrigation, water closets, urinals, laundry, outdoor cleaning and water features. It is recommended that all water entering a residential system be filtered and disinfected except where a non-potable water distribution system is installed and maintained in accordance with the applicable Code requirements.

Potable rainwater harvesting systems require treatment after the water leaves the cistern to remove sediment and disease causing pathogens from the stored water. Treatment systems should be located as close to the final point of use as possible. All parts of a treatment system must be regularly maintained. Treatment system selection and sizing are beyond the scope of these guidelines.

7.5.1. Filtration

Sediment filtration should be provided, to no greater than 5 microns for reduction of contaminants that may mask bacteria or cloud the water before disinfection. Filters should be of an appropriate size to provide several months of service between cleanings. Sand filters are recognized by Health Canada. Reverse Osmosis may be appropriate in some situations. Carbon filtration may be provided for improving taste and reduction of odor and organic chemicals.

Filters must be installed upstream of disinfection systems.

7.5.2. Disinfection

The following processes may be used to provide disinfection:

1. Chlorination: Chlorination may be used with an automated demand feed system. Provide constant contact with the chlorine and enable adequate contact time according to local health authorities.
2. Ozone: Ozone may be used with an approved ozone system ensuring adequate contact time with the ozone. Provision must be made to off gas ozone to a safe environment.
3. Ultra-violet disinfection may be used between filtration and final Point of Use.

All disinfection systems shall be sized and selected to perform under all flow conditions and should be designed, installed and maintained by qualified personnel. Bacteria testing shall be done at an accredited lab to validate the disinfection process.

8.0 Maintenance

The collection system, conveyance piping and storage system should be cleaned prior to use. The treatment system including filters and disinfection should be rinsed and disinfected prior to use. Potable water from a Rainwater Harvesting system should be tested regularly to confirm that it is safe to drink. Rainwater harvesting systems require monthly and seasonal maintenance to ensure consistent water quality. All systems should be maintained in good working order. It is the owner's responsibility to maintain the system according to manufacturer's recommendations. Filtration and disinfection components should be serviced according to manufacturer's recommendations and good engineering practice. An owner's manual, showing all aspects of the system including maintenance procedures, should be available.

9.0 Abandonment

If the owner of a rainwater harvesting system elects to cease use of, or fails to properly maintain such system, the system should be decommissioned as follows:

- 9.1 Remove the system entirely;
- 9.2 Replace the rainwater harvesting system with an approved potable water supply pipe system. Where an existing potable pipe system is already in place, fixtures may be re-connected to the existing system.
- 9.3 Backfill all abandoned underground tanks or excavations with pea gravel or other approved material

Rainwater harvesting system abandonment and potable water installations may require municipal permits and inspections.

10. References

- Rainwater Catchment Systems for Hawai'i*. Patricia S.H. Macomber
Sustainable Water from Rain Harvesting. 3rd Edition. Environmental Conservation Planning Pty Ltd. Australia
The Rainwater Connection. Bob Burgess www.rainwaterconnection.com
The Texas Manual on Rainwater Harvesting. 3rd Edition. Texas Water Development Board
Canadian Standards Association. CSA B64.10. CSA-B128.1/CSA-B128.2 (Draft only)
National Sanitation Foundation. NSF 61
British Columbia Building Code 1998
Health Act – Province of British Columbia
Drinking Water Protection Act and Regulation – Province of British Columbia
Drinking Water Officers' Guide

Appendix A

Rainfall Catchment Water Budget

The creation of a detailed water budget is not the subject of this Guide. That said, a well documented water budget and the resulting month by month water balance table will ensure a correctly sized cistern. This is a brief outline explaining the amount of water use and the potential amount of collection. A cistern is the most expensive part of a rainwater harvesting system; a properly calculated water balance table will indicate the most efficient cistern size.

The amount of rainwater needed for a home will vary according to types of use, number of occupants (including guests) and lifestyle. Amounts utilized will vary month to month and season to season; be sure to calculate indoor and outdoor use separately. Statistics show that a typical household uses 50 – 60 gallons/ person/day (G/P/D) for full time residents. Rainwater dependent households typically use 35 – 40 G/P/D and some are as low as 25 – 30 G/P/D. The amount of water needed for outdoor use will also vary according to types of landscaping, number of plants, car washing, etc and the need for fire protection.

The potential amount of water you can collect is based on the following formula;

"1 inch of rain on 1 square foot of roof produces .52 imperial gallons of water or 1 millimeter of rain on 1 square meter of roof produces 1 litre."

The actual amount of rainwater you can collect depends on 3 factors;

1. Annual Rainfall - see the Environment Canada website at www.climate.weatheroffice.ec.gc.ca/climateData/monthlyData_e.html for monthly/annual averages.
2. The size of your roof (the area from a bird's eye view including overhangs).
3. The portion of the actual rainfall you can collect. This will depend on a number of factors such as prevailing winds, type of roofing, tree cover, and gutter/pipe sizing during storm events. Typical systems capture 75 – 85% of the total rainfall.

There are a number of publications and consultants which can provide additional information for the purposes of completing a water budget. See the references on page 12.

Appendix B

Consultation Schedule and Summary

Date:	March 27, 2006
Project:	Guide for Regulating the Installation of Rainwater Harvesting Systems – Potable and Non-potable Uses
Client:	Islands Trust Fund Capital Regional District Water Services
Consultant:	Dick F. Stubbs
Re:	Summary of Consultations during the Project
Oct 6, 2004	Meeting at Islands Trust office in Victoria to discuss demonstration project .
Dec 13, 2004	Drafted "Sample Water Catchment Systems Design". Reviewed with CRD staff on Salt Spring Island.
June 8, 2005	Rainwater discussion at CRD Victoria.
June 20, 2005	Rainwater Conference, University of Victoria. Panel presentations.
July 13, 2005	American Rainwater Catchment Systems Association Conference in Seattle.
July 2005	Referred draft ARCSA Guidelines to BC Plumbing Officials Association and a number of Building Officials. Little comment other than "we are too busy".
July 2005	Review: The Texas Manual on Rainwater Harvesting. Rainwater Catchment Systems for Hawaii.
Aug 2005	Review and Comment: CSA Draft B128.
Oct 2005	Hornby Island Rainwater workshop. Approximately 15 attendees. Toured and interviewed 2 working rainwater systems (Rankin's and Gadsby's).
Nov 2005	Review: Sustainable Water from Rain Harvesting (Australia)
Nov 9, 2005	Discuss Guide with Clare and Lisa.
Nov/Dec 2005	Discussions regarding the Guide with Clare, Lisa, Colwyn. At about this point I realized that the ARCSA Guide was not sufficient for our needs as a root document.
Jan 10, 2006	Begin new draft of the Rainwater Harvesting Guide.
Jan 16, 2006	Draft Guide sent to N. Beattie (Chief Building Inspector for Oak Bay and Building Officials Association Zone Director for lower Van Island) for circulation to Lower Vancouver Island Building Officials.
Jan 17, 2006	Meet with Clare, Lisa, Colwyn and Gerry at IT in Victoria. We have a project.
Jan 26, 2006	Present Guide to Building Officials in Victoria. Numerous questions seeking an understanding. No voiced concerns.
Jan 27, 2006	Salt Spring Water Council will circulate the Guide.
Feb 7, 2006	Input re guide from Bob Burgess.

- Feb 8, 2006 Email from M Leichter, homeowner who harvests rainwater, concerned that sand filters are not listed.
Referred draft to J. Spenser at VIHA, Erwin Dyck at VIHA, G Jensen at BC Plumbing Officials Association.
- Feb 9, 2006 Presentation to Vancouver Island Plumbing Officials, approximately 20 attending. Main concerns center around the issue of cross connection between potable and non-potable systems and the identifying of non-potable piping.
- Feb 10, 2006 Email from Bob Watson, retired Public Health Engineer. Reviewed draft no major concerns.
- Feb 14, 2006 Email from Adam Scheur at Water Tiger pointing out that sand filters are recognized by CMHC and Health Canada.
- Feb 20, 2006 Discussion with John Spenser and Murray Sexton, VIHA Public Health Engineers in Nanaimo. Main issues are interconnection related.
- Feb 23, 2006 Discussion with E Dyck at VIHA no issues.
- Mar 7, 2006 Meeting at CRD Water Services. Stewart Irwin, Bob Sochowski, Colwyn Sunderland, Alan Gibson, Rick Hayhurst. Good points made regarding interconnection issues, identifying non-potable piping and fixtures. Their views pointed to a more regulatory approach.
- Mar 9, 2006 Email from Alan Gibson at CRD Environmental Services raising contamination concerns and suggesting clearer wording in some areas.
- Mar 10, 2006 Email from Adam Scheur at Water Tiger, comments regarding treatment and disinfection.
- Mar 21, 2006 R. Guilliland (Salt Spring Water Council) raised concern by e-mail regarding additional regulation not required for wells and raising question re: collection from other areas.
- Mar 24, 2006 Email from Lisa Dunn/Colwyn Sunderland. Colwyn commented and drafted changes reflecting the desired direction of the Guide.
- Mar 30, 2006 Presentation to Salt Spring Water Council. Comments to come.

Comments

1. It is likely that we will receive additional comments and ideas as the Guide goes into circulation. An update will need to be done in due course.
2. VIHA staff were able to provide some good ideas during discussion but were concerned that their "involvement" might be construed as an approval of the Guide. "Private water systems" are not part of their jurisdiction.



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