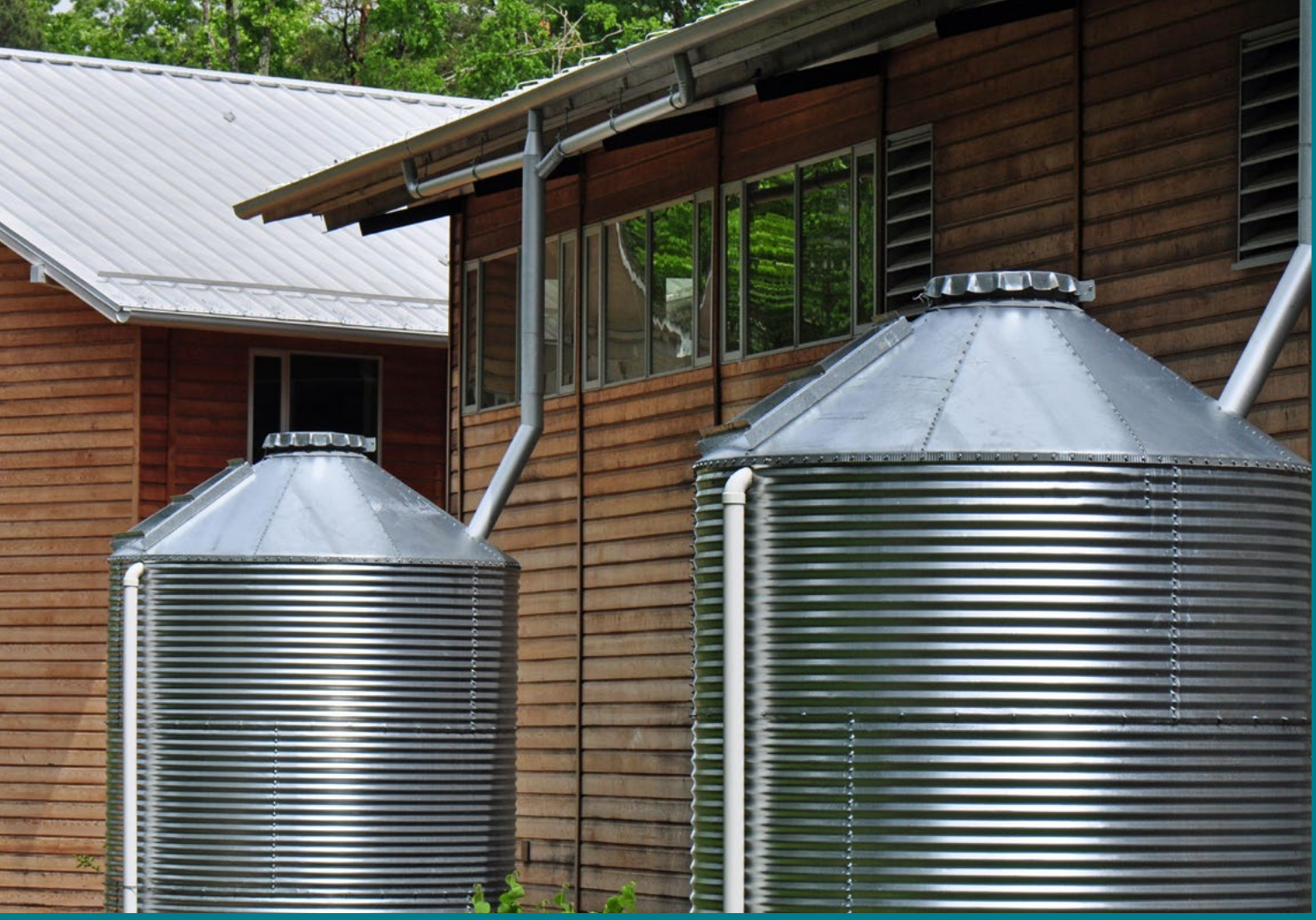

RAINWATER CATCHMENT SYSTEMS

Rainwater Catchment Systems

Almost all the water that has ever existed on our planet is the same water we see today, 97% of which is nonpotable sea water. The remaining 3% of this water is freshwater, most locked in ice caps, glaciers and the ground. Only a fraction of a percent is the surface water we typically depend on. To put it in perspective, if all of the earth's water were condensed down to fit into a single gallon jug, the freshwater readily available for our use would equal about one tablespoon. As the world population continues to increase so does the demand on this finite freshwater resource.

One ancient and low impact technique for obtaining freshwater is rainwater harvesting. This collection method is making a resurgence, aided by increased awareness of sustainability and new green building practices. Methods for collecting rainwater have been successfully used by our ancestors for thousands of years. To summarize the process, a large impermeable surface such as a roof initially "catches" rainwater. The rainwater is then diverted away from a catchment surface by gravity and a network of gutters, pipes or tubing, eventually ending up in a protected tank or cistern. This stored freshwater may be used over time, as needed, for either potable or nonpotable needs. With as little as 1" of rainfall on a 2,000 ft^2 roof, 1,250 gallons of water could be harvested. For most locations in the US and Canada, tens of thousands of gallons of freshwater can be harvested by a typical family size residence annually.

Common Questions

- Are there regulations in place for the construction of rainwater catchment systems and the usage of the water they collect?
- How is the quality of the collected water ensured, especially if intended for potable use?

Until recently, these questions had no clear answers, and modern, wide-scale rainwater catchment system implementation is still in its infancy. Therefore, it is always best to first check with local and state governments to determine if there are any restrictions. Many cities and states now have guidance on the construction of rainwater catchment systems available on-line. Other helpful resources are available on websites such as ARCSA.org (The American Rainwater Catchment Systems Association).

In late 2013, ARCSA and ASPE (The American Society of Plumbing Engineers) published the first Plumbing Engineering and Design Standard for Rainwater Catchment Systems titled *ARCSA/ASPE 63-2013*. The objective of the standard is to provide guidance on creating and maintaining a safe alternative to utility or well water sources by reducing consumer risk from poor design, installation and maintenance of rainwater catchment systems.

In addition to the published *ARCSA/ ASPE 63-2013* standard both CSA (Canadian Standards Association) and the ICC (International Code Council) have partnered to form a rainwater collection system design and installation standard development committee. Currently in draft format, CSA/ICC 805-201x would become a similar standard for the design, installation and maintenance of rainwater collection systems intended to collect, store, treat, distribute and utilize rainwater for potable and nonpotable applications. It will be up to local authorities as to which standard will be adopted for rainwater collection systems built under their jurisdiction. Local water collection regulations and codes will still take precedence.

When it comes to potable water there are additional precautions to keep in mind. Although rainwater can be quite pure, organic debris such as branches, leaves, pine needles, insects and even bird waste can end up on a rooftop. It is important to set up gutter protection, pre-filtration and first flush diversion devices prior to water entering a cistern for storage. The design standards mentioned previously explain these tools in-depth. Stored water intended for human consumption will require additional processing to ensure that the water will be safe to drink. Proper water filtration and purification is still required. This can be accomplished with third-party certified reverse osmosis, microfiltration or UV sterilization units. Any water treatment chemicals or filtration media used should also be evaluated to NSF International standards. Additionally, the U.S. EPA (Environmental Protection Agency) recommends that consumers have their private water supplies checked at least annually for bacterial contamination by their local health department. This includes well and harvested rainwater sources.

In addition to contamination from outside the system, all components and materials in contact with rainwater intended for potable end use should comply with NSF (National Sanitation Foundation) standards P151 and/or 61. Compliance determines that a water supply remains free from harmful levels of chemical contaminants extracted from a catchment system. NSF P151 is a testing protocol which covers gutters, barrier materials and/or catchment surfaces (coatings, paints, lining and liners) placed on roof tops and ground surfaces that come in direct contact with rainwater collected and used as drinking water. NSF 61 focuses on the additional conveyance system components such as pipes, fittings, gaskets, sealants, cisterns/tanks, valves, pumps, and faucets or spigots. Both NSF P151 and NSF 61 are used by third-party testing laboratories to assess the concentration of contaminants extracted from surfaces and components exposed

Benefits of Harvesting Rainwater:

- Rainwater is free. The only costs are in the construction of a catchment system.
- The rainwater is used at its source, eliminating the need for a large-scale and costly distribution system.
- It provides freshwater when other sources, including groundwater, are unavailable.
- Rainwater starts pure with little or no dissolved minerals or harmful chemical contaminants.
- Rainwater harvesting helps reduce stormwater runoff, reduces demand on existing water utilities and can help drop consumer utility bills.
- Green building rating systems, such as LEED, award points for water conservation measures like harvesting rainwater.

Document requirements regarding NSF P151, NSF 61, and NSF 372.

	NSF P151 required	Either NSF P151 or NSF 61 required	NSF 61 required	NSF 372 required
2015 Uniform Plumbing Code	Collection surfaces must be approved for potable use. Roof coatings, paints, liners shall comply with P151.	N/A	Potable rainwater supply and distribution materials must meet the potable water supply requirements of the code.	N/A
ARCSA/ASPE/ ANSI 63-2013 and 78-2015 Published	Flat Roof Products	Painted surfaces	Cisterns, plastic storage tanks Pumps Other wetted conveyance system components	N/A
CSA/ICC 805-201X Draft	Roofing materials "Can be"	Paints and coatings applied to collection surfaces	All potable water contact materials Storage tanks, liners, coatings, pipes, fittings, pumps, sealants, and other appurtenances	All potable water contact materials Storage tanks, liners, coatings, pipes, fittings, pumps, sealants, and other appurtenances
IAPMO We Stand 2017 Draft	Roof coatings, paints, and liners Gutters Downspouts	N/A	Leaders and Conductors Tanks, liners, and coatings	N/A

to rain, and whether the concentrations of these contaminants exceed known safe drinking water limits. P151 goes a step further to assess health effects of microbial growth on catchment system materials and UV weathering on roofing materials.

Rainwater harvesting system design standards along with the Uniform Plumbing Code (UPC) stress the importance of components evaluated to NSF standards when harvesting potable water. Above is a table that shows current requirements regarding NSF P151 and NSF 61.

How to determine compliance to the applicable NSF standards

Products, components or materials meeting the applicable NSF standard requirements can earn certification from an accredited third-party testing laboratory such as UL.

If you are a consumer, contractor, engineer or architect, look for UL certified products when building a rainwater catchment system. If you're a manufacturer, partner with UL, the safety science industry leader to demonstrate that your product meets the requirements for potable water contact.

Benefits of certification with UL:

- Personalized service — one experienced staff member assigned to your project
- Team of experts work directly with customers throughout the entire process
- Full ANSI/SCC accreditation for providing certification to NSF standards in the US and Canada

UL is a global independent safety science company with more than a century of expertise innovating safety solutions.

UL offers water related certification to:

- NSF P151 (Health Effects From Rainwater Catchment System Components)
- NSF/ANSI 60 (Drinking Water Treatment Chemicals-Health Effects)
- NSF/ANSI 223 (Conformity Assessment Requirements for Certification Bodies that Certify Products Pursuant to NSF/ANSI 60)
- NSF/ANSI 61 (Drinking Water System Components – Health Effects)
- NSF/ANSI 372 (Drinking Water System Components – Lead Content)
- BNQ 3660-950 (Safety of Products and Materials in Contact with Drinking Water – Québec)
- CSA, IAPMO, and ASME plumbing fixture and fitting standards