

The drop on water

Cisterns

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A cistern is a large storage tank for holding water. Cisterns may be used as a household water supply in areas with low well capacity or poor water quality. It is normally a rectangular tank (see Figure 1), made of concrete or a material that has been certified to meet the current NSF standards for materials in contact with potable water. NSF International is a not-for-profit, non-governmental organization that sets health and safety standards for manufacturers in 80 countries. See its website at www.nsf.org.

Cisterns are often made of reinforced concrete, fiberglass, or polyethylene. If these materials do not meet the current NSF standards for materials in contact with potable water, the cistern should be lined with a material that meets the current NSF standards. Tanks are normally located underground, but can be located above the ground surface if they are in a heated structure.

The two main sources of water for filling a cistern are

- potable water hauler
- rainwater collection

Cisterns may also be filled through slow pumping from low-yield groundwater wells.

QUICK FACTS

- A cistern is a large storage tank for holding water for household use.
- Cisterns may be filled by a potable water hauler or through rainwater collection.
- The size of cistern you need depends on several things, including the size and water-use habits of the household. If you are collecting rainwater, the amount of rain and the size of the collection area matters.
- Hauled water from a municipal supply is safe to drink if the hauler follows the *Potable Water Hauler Guidelines*.
- Rainwater collected in a cistern must be filtered and disinfected before being consumed.
- A cistern water system must be inspected, maintained, and cleaned regularly.

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Potable Water Hauler

Potable water haulers transport and deliver potable water in a water tank fixed to a truck. The tank should be made of stainless steel or a material that has been certified to meet the current NSF standards for materials in contact with potable water. The water tank is filled at the source and delivered to the cistern. Water supplied by a potable water hauler is often from a municipal supply. Municipal water utilities in Nova Scotia are responsible to make sure the water is properly managed and protected. It has been treated prior to delivery by the water hauler. Some haulers may use a public drinking water supply that is registered with Nova Scotia Environment and is monitored and tested according to the *Guidelines for Monitoring Public Drinking Water Supplies*. Ensure that you deal with a hauler that follows the *Potable Water Hauler Guidelines*, found at www.gov.ns.ca/nse/water/docs/PotableWaterHaulerGuidelines.pdf.

Collecting Rainwater

Rainwater is captured from the rooftop of a building for storage in a cistern. Water collected from the roof may be contaminated with pollutants such as dust, metals, and bird droppings or other animal waste. Water collected in a cistern from rainwater must be filtered and disinfected before using for domestic purposes. See the Treatment section of this fact sheet for more information.

Any untreated rainwater is suitable for watering plants, lawns, etc.

When a cistern is proposed for a new or existing building or home, it should be indicated on the design drawing and brought to the attention of the municipality on any permit application.

Find a list of municipal building officials in Nova Scotia at www.gov.ns.ca/snsmr/muns/contact/grouped/buildinginspectors.asp.



Cistern Components

Primary components for all cisterns:

storage reservoir – This is the tank in which water is stored. The recommended tank size depends on numerous factors. Minimum recommended capacity is 27,000 litres (6,000 gallons), if a cistern is your only source of water.

screened vent – The need for a vent depends on the cistern design. In some cases a screened vent is needed to ensure that the interior of the tank is not under pressure. The screen prevents surface contaminants from entering the water supply. The vent opening should face downward to keep airborne contaminants out of the water supply.

access hatch – The access hatch allows access to the cistern for inspection, maintenance, and cleaning.

pipng – The plumbing for a rainwater cistern system is similar to that required for any other type of water supply. However, rainwater can be corrosive, with a low pH, low hardness, and alkalinity, and may leach certain metals from metal pipes into the drinking water supply. For more information, see our fact sheets on hard water, corrosive water, pH, and alkalinity at www.gov.ns.ca/nse/water/thedroponwater.asp.

withdrawal pipe with screen – The point of withdrawal from the cistern should be at least 10–15 centimetres from the bottom of the tank. This intake height and the screen reduce the possibility of sediment intake.

overflow pipe – This pipe allows for spillage, by directing excess water away from the house when the cistern is full.

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Additional components for cisterns filled by rainwater:

pre-filter – A pre-filter is installed at a point before the water reaches the reservoir. It is normally made of sand, a nylon sock, or a geotextile material. The filter will reduce the buildup of sediment and debris in the cistern. A filter by-pass is normally also installed to allow water to flow past the filter in case the filter becomes clogged.

downspout entry site – This is the place where the downspout connects to the cistern. It normally has packing around it to ensure it is water-tight.

catchment surface – This is the collection surface from which rainfall is collected, normally the roof. Asphalt shingles, polyethylene sheathing, and fiberglass panels are all acceptable materials for roofs connected to rainwater cisterns. Metal (including galvanized metal) and cedar can both leach into the water and are therefore not recommended as roof materials for homes with rainwater collection systems.

gutters and downspouts – Plastic and enameled aluminum are both acceptable materials for gutters and downspouts.



Figure 1 – Components of a Typical Cistern System

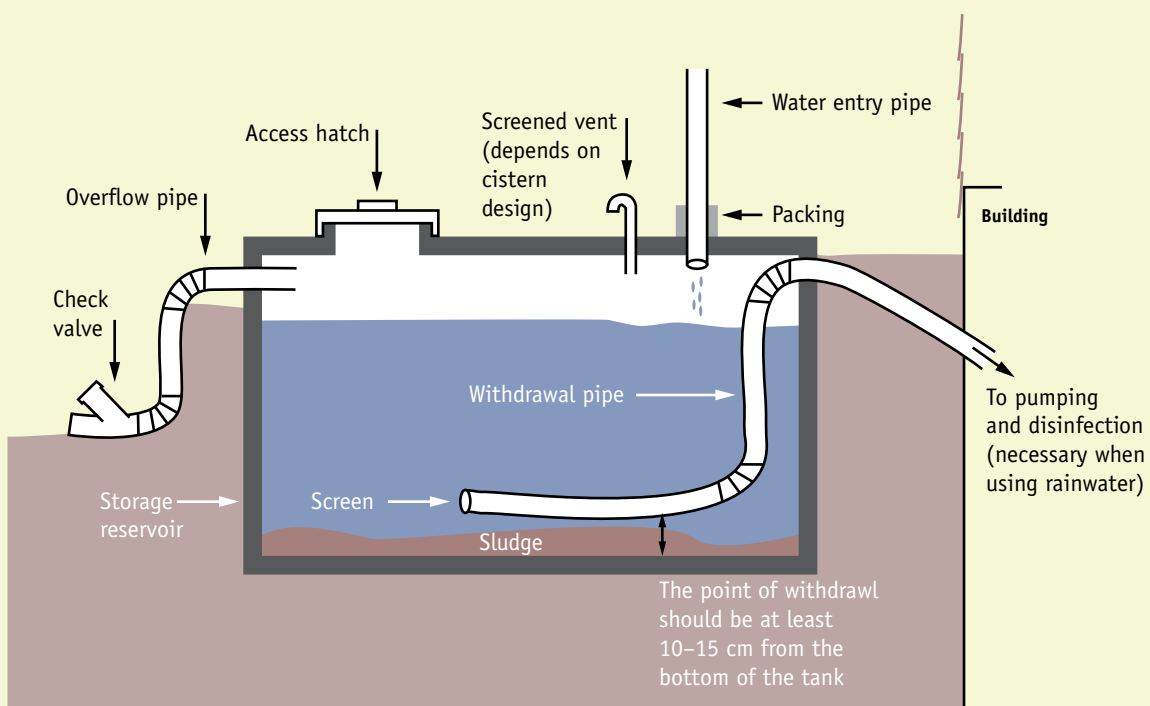


Diagram not to scale.

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Cistern Storage Capacity and Use

Homes of two to four people need about 680 to 1360 litres (150 to 300 gallons) of water each day to meet typical water needs.

If the cistern is your sole supply of water, the recommended minimum size is 27,000 litres (6,000 gallons). To calculate the size of your cistern, you should know

- whether the water supplied by the cistern system will be used as the sole source of water or as a supplementary supply
- the size of the household using the cistern system
- the water-use habits of the household
- the size of the collection area, if collecting rainwater
- the average annual rainfall in your area, if collecting rainwater

The Centre for Water Resources Studies (CWRS) at Dalhousie University has developed software that can be used as a guide when estimating the cistern size needed, when collecting rainwater. It can be found at www.centreforwaterresourcesstudies.dal.ca/Rain_Water_Cisterns/Modelling%20Software/. The software has a useful instructions section. The CWRS software calculates the “% of Days Demand Fully Met”. In order to meet your household demands by using rainwater as the sole source of water, the “% of Days Demand Fully Met” should be between 95 and 100%.

It is very important that you know the water use in your household because this makes a big difference in your ability to meet your water needs using a rainwater collection cistern.

You should have a good idea of the average rainfall for your area, because some months you may not be able to collect enough water for household use from rainfall alone. Annual and monthly precipitation information for different areas of Nova Scotia is available from Environment Canada at www.climate.weatheroffice.ec.gc.ca/climatedata/canada_e.html.



Treatment

When water supplied by a potable water hauler is obtained from a municipal drinking water supply, the municipal water utility makes sure the water is safe to drink. The water hauler is responsible for making sure the water stays safe by using the *Potable Water Hauler Guidelines*. Homeowners are responsible for keeping the cistern clean to maintain the quality of water.

Water should never be hauled from an untreated water supply, lake, or river. This can make you sick. Surface water must be properly treated, using filtration and disinfection. See our fact sheet on surface water for more information at www.gov.ns.ca/nse/surface.water/docs/SurfaceWaterQA.pdf.

Rainwater collected in a cistern must be filtered, disinfected, and tested before it is suitable for household uses such as

- drinking
- preparing infant formula
- preparing juices or ice cubes
- washing fruits and vegetables
- cooking
- brushing your teeth

In addition, many cistern supplies may need a pH adjustment, since rainwater may be corrosive towards metals in the system. For more information, see our fact sheet on corrosive water at www.gov.ns.ca/nse/water/thedroponwater.asp.

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Filtration

Filtration removes certain contaminants, sediment, and unwanted tastes. A filter must be located before a disinfection unit. This is because filters may promote bacterial growth, which can then be removed by disinfection.

Disinfection

Disinfection is essential to reduce the possibility of bacteria and pathogens being present in drinking water. The most common type of household disinfection uses ultraviolet light (UV light). Chlorine and ozone are also effective disinfection methods for microbial contamination.

Buy a treatment system that has been certified to meet the current NSF standards for the inactivation of bacteria. NSF International is a not-for-profit, non-governmental organization that sets health and safety standards for manufacturers in 80 countries. See its website at www.nsf.org.

An ultraviolet light unit that is purchased for drinking water disinfection must be NSF 55 Class A approved. UV units without the Class A certification are only intended to be used for the reduction of non-pathogenic nuisance organisms. UV lights are intended for water that is visually clear (that is, not coloured, cloudy, or turbid). If the water is turbid, it should be filtered first to clarify the water.

Maintain the system according to the manufacturer's instructions to ensure a continued supply of safe drinking water.

For more information on water treatment, see our publications *Water Treatment Options* and *Maintaining Your Water Treatment*, part of the *Your Well Water* booklet series at www.gov.ns.ca/nse/water/privatewells.asp.



pH adjustments

The Canadian drinking water quality guideline for pH is an aesthetic objective (AO) of between 6.5 and 8.5. Rainwater in Nova Scotia may have a pH less than 6.5, which may contribute to the corrosion of pipes and fittings. A pH less than 6.5 is not a health risk in itself, but corrosive water can dissolve metals present in pipes, such as lead, cadmium, zinc, and copper. This may lead to increased concentrations of these metals in drinking water, which can cause health concerns. See our fact sheets on pH, lead, cadmium, zinc, copper, and corrosive water for more information at www.gov.ns.ca/nse/water/thedroponwater.asp.

Cistern Costs

Cistern costs can vary greatly depending primarily on the size and location of the cistern and the materials used. Typical costs can be between \$200 and \$900 for every 1,000 litres of storage capacity (\$1,000 to \$4,000 for every 1,000 gallons).

Cistern System Maintenance

For the water system to continue working properly, the cistern and its components must be inspected, maintained, and cleaned regularly. You should also regularly test the water to make sure the bacterial and chemical quality is acceptable.

Whatever the source of water, water stored for more than 14 days needs chlorine bleach added to minimize bacteria and algae growth, particularly in the warmer summer months. Add 20 mL of bleach for every 1,000 litres of water (3 oz. per 1,000 gallons) in the cistern. Never use non-chlorine bleach or scented bleach to treat water.

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Storage Reservoir (Cistern)

Slime or sludge will tend to accumulate on the bottom of the cistern. This will significantly affect the water quality. The rate of accumulation will depend on

- system design
- the proximity of the cistern to vegetation (trees), if collecting rain water
- the frequency of gutter cleaning, if collecting rainwater.

Clean the cistern before the sludge buildup exceeds 2.5 cm (1 inch). The cleaning process should take place at a time when the water level in the compartment to be cleaned is minimal, to reduce the amount of water to be removed.

A cistern is considered a confined space. Only those trained in confined space entry should enter a cistern. Special equipment and a safety plan are also needed to enter and clean a cistern. Look for a cleaning company that has a confined space entry protocol and testing system in place. You can also refer to part 12 of the *Occupational Safety General Regulations* at www.gov.ns.ca/just/regulations/regs/ohsgensf.htm.

The water in the cistern compartment should be pumped down to a depth of about 30 cm (1 foot). An advantage of cisterns with two compartments is the ability to pump water from one compartment to the other during cleaning. When the qualified person enters the chamber, he or she must ensure there is enough ventilation for anyone working inside the cistern.

Most of the sediment is removed by agitation. This suspends any sediment in the remaining volume of water. This water is then pumped out of the cistern. The interior of the cistern should be swabbed with a solution of household chlorine bleach with a concentration of 3 mL/L (0.5 oz/gallon). At least 3 hours of contact time are normally allowed before the final rinse. Rinse water may be supplied from the second compartment, if one is available. For a tank with only one compartment, rinse water may have to be supplied by a water hauler. When cleaning is complete, approximately 20 mL of bleach for every 1,000 L of water (3 oz. per 1,000 gallons) is added to the cistern to ensure thorough disinfection.



Roofs, Gutters, Downspouts, and Piping System (for rainwater collection)

Roofs, gutters, downspouts, and the piping system should be inspected four times a year and after severe storms for debris buildup and failure of components, such as cracked or leaking gutters and downspouts or misaligned screens.

Pre-filter (for rainwater collection)

The pre-filter should be inspected four times a year for sediment buildup as well as the need for cleaning or replacement of filter parts.

Considerations

Some rainwater collection systems are designed to waste the first flush of roof water, which often has more solids/debris and possibly higher concentrations of bacteria from bird droppings and other contaminants.

FOR MORE INFORMATION

Contact

Nova Scotia Environment at
1-877-9ENVIRO
or 1-877-936-8476

www.gov.ns.ca/nse/water/



