

# Water Storage Tanks (Cisterns)

*This fact sheet is intended to be a general reference for cistern users. For detailed information on cistern construction and material standards, owners should refer to Canadian Standards Association (CSA) B126 Series-13 on water cisterns.*

Water storage tanks, also known as cisterns, are primarily used to store water for domestic and consumptive purposes in households or buildings.

Cisterns are typically found in areas where a potable water source is not available in the community, the area yields low well water capacity, or the groundwater quality is poor. Cisterns can also be used to store water:

- a) to supplement a low yielding private water well
- b) as an emergency water supply
- c) for seasonal/occasional use

## Rainwater Collection

Home and business owners that collect rainwater in a cistern for the purpose of watering gardens and lawns should not drink the water. Water runoff collected from a roof into a cistern may contain contaminants, including harmful bacteria from bird droppings and other sources.

## Water Hauling

Cistern owners using the water for drinking and domestic purposes should hire the services of an approved bulk water hauler for water supply. Under *The Public Health Act* regulations, bulk water haulers must obtain a valid permit to sell or convey water for sale for domestic purposes. The water hauling vehicle and associated equipment must be designed, operated and maintained in a sanitary manner to ensure that water does not become contaminated and pose a risk to public health. For more information on the Bulk Water Hauling Guidelines and approved haulers, please visit the Manitoba Health website at:

<http://www.gov.mb.ca/health/publichealth/environmentalhealth/protection/docs/bulkwater.pdf>

Cisterns used for domestic purposes should never be filled with water from an untreated water supply, lake, or river. Consuming untreated water, especially from surface water sources, can make you sick. Surface water must be properly filtered and disinfected prior to any consumptive use.

## Construction Material

Reinforced concrete, fiberglass, polyethylene, concrete and steel can be used to construct cisterns. The use of polyethylene (PE) plastic and fiberglass is increasing as these materials are waterproof and do not rust. Size, shape and cost typically influence material selection.

# Well Water and your health

Cisterns are usually pre-fabricated. Larger units may be custom fabricated or cast in place. The material and any internal coatings must be suitable for potable water use. Cisterns, including all of their components must be certified to “*NSF/ANSI Standard 61 : Drinking Water System Components – Health Effects*” ([www.nsf.org](http://www.nsf.org)).

## Basic Design Components

Detailed information on cistern design, construction materials, manufacturing practices, testing methods, and markings is available in Canadian Standards Association (CSA) B126 Series-13 standards (see [www.csagroup.org](http://www.csagroup.org)). Some general information is provided below.

**Storage Reservoir:** The cistern’s size depends directly on how much water is used and how often water is delivered by the water hauler. Assuming the average person uses 300 litres a day, and on average there are 3 members per household, the average water demand for a household is 900 litres a day, or about 200 imperial gallons per day. Therefore, household cistern volumes are typically 5500 litres to 7500 litres (about 1200 to 1650 imperial gallons). A larger or smaller volume may be suitable based on household size, water demand, and water delivery frequency. A float switch and alarm can be installed to indicate a low water level in the cistern.

Oversizing a cistern will affect the quality of the water. Over time, the chlorine (disinfection) residual which helps control bacterial growth in the cistern and water pipes will dissipate. Storing water too long may also affect its taste and odour. Refilling the cistern once a week is ideal. A water supplier should be able to assist you in determining an appropriate size for your cistern. The higher the frequency of water delivery, the better the water quality will be. The cistern size should balance the additional cost of refilling with the need to maintain fresh clean water.

If you have concerns over the age of the water and chlorine residuals found in a water hauling truck, you can request that the water supplier test the chlorine residual in the water upon delivery and prior to refilling. Chlorine test kits are also available from swimming pool suppliers and chemical suppliers. Adding some chlorine to cistern water that has been stored for a period of time past a scheduled refill will help maintain a chlorine residual (see “Continual Disinfection of Cistern Water”).

**Access Hatch:** The cistern should allow entry for inspection, maintenance, and cleaning through an access hatch or port. The access hatch lid must be lockable and designed to prevent entry of surface water runoff and insects, or vandalism, etc.

**Air Vent:** Air flow should be provided by an appropriate air vent located at least 0.6 metres (about 24 inches) above ground level. The vent should be screened and opening facing downwards towards the ground surface (gooseneck vent) to prevent surface contaminants and small debris from entering the cistern.

**Fill Port:** A fill port should be used to prevent hoses, debris, and other contaminants from entering the cistern at the time of refilling. Fill ports equipped with cam locks and screening are an option to prevent entry of contaminants into cisterns.

**Withdrawal Pipe with Screen:** The withdrawal pipe, which is the connection between the dwelling/business and the cistern, should be installed approximately 10 to 15 centimetres (about 4 to 6 inches) above the bottom of the cistern. This will reduce the possibility of sediment that collects at the bottom from entering the plumbing system.

**Water Pump and Pressure Tank:** Underground storage tanks require a water pump and pressure tank to draw water from the cistern for distribution throughout the dwelling/business.

## Cistern Placement

There are no regulatory requirements for cistern placement in Manitoba. However, it is recommended that cisterns be installed in an area that will allow easy access for water haulers and for maintenance and cleaning. Depending on the situation, cisterns can be installed underground or above ground.

Underground cisterns should be located below the frost line (often 2.4 metres or approximately 8 feet is assumed), or the cistern should be adequately insulated. Adequate insulation should also be provided for above ground cisterns and their components to prevent freezing.

Underground cisterns should be installed a safe distance from possible contamination sources. The Onsite Wastewater Management Systems Regulation (M.R. 83/2003, under *The Environment Act*) requires septic tanks and aerobic treatment units to be set back at least 3 metres (about 10 feet) from a cistern.

Other possible contamination sources that you should consider when placing a cistern that do not have regulation set back distances include:

- i) septic fields (minimum of 15 metres or about 50 feet)
- ii) chemical storage areas (minimum of 30 metres or about 100 feet)
- iii) trees (depending on root size)
- iv) animal corrals and pens

Adequate bedding should be provided during the placement of underground cisterns so the cistern is properly supported. A cistern supplier or installer should be able to help you with determining the appropriate material and amount of material required for bedding. Precautions should be taken to limit the potential for groundwater infiltration, hydraulic uplift, and for surface water to pond above an underground cistern.

Above ground cisterns installed in basements or crawl spaces must be installed in such a way as to allow easy access for routine cleaning and disinfecting. A minimum of 1 metre (about 3 feet) of space should be maintained between the access hatch of a tank and any overhead building features such as floor joists, ceilings, beams, etc. If this is not feasible, then installations should include a trap door above the tank to facilitate access.

## Disinfecting/Cleaning Cisterns

Cisterns should be periodically cleaned and disinfected. Over time, the loss of chlorine residual can lead to microbial growth, sediments and sludge can accumulate in the cistern, or insects and debris may have fallen in. **NEVER ENTER A CISTERN UNLESS YOU ARE PROPERLY TRAINED IN CONFINED SPACE ENTRY.** Do not use an ammonia-based cleaner to clean a cistern as ammonia reacts with chlorine to produce a hazardous gas. Precautions and regulations related to confined space entry must be followed if entering a cistern. For more information regarding working in confined spaces, contact SAFE Manitoba (204-945-6848, [www.safemanitoba.com](http://www.safemanitoba.com)).

Cleaning and disinfection of a cistern should be done once a year, and following:

- construction, repair or maintenance work on the cistern
- flooding in the area of an underground cistern
- a period of non-use
- sampling which indicates the presence of bacteria

### Preparing to Clean:

The best time to schedule a cleaning is at the end of a water use period just prior to a refill. It is important to do the following prior to beginning the cleaning and disinfection process:

1. Arrange a water delivery for the day you do the cleaning and for the following day for disinfection.

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2. Advise everyone that the cistern is being cleaned and disinfected and not to use the water.
3. Store enough water to last the household/business for up to 24 hours. Use a safe source of bottled water for drinking during the disinfection process or fill clean water containers with a safe source of drinking water. The bathtub can be used to store water for other household purposes.
4. Buy new containers of regular, unscented, detergent-free chlorine bleach as bleach can lose its strength over time.
5. Gather the tools you will be using to clean the tank, including a new mop or brush, pressure washer and wet-dry vacuum.
6. Rinse and disinfect any tools that might come in contact with the cistern interior surfaces such as vacuum nozzles or bristles. Use 10 millilitres (or 2 teaspoonfuls) of unscented, detergent-free household bleach mixed with 4 litres (about 1 gallon) of water from a safe source. Let the mixture stand for at least 10 minutes before using it to disinfect tools.
7. Disconnect or bypass any water treatment devices such as filters and reverse osmosis (RO) systems. Check the owners' manuals for instructions on cleaning or disinfecting the treatment equipment.
8. Shut off power to your water heater.

## **CONFINED SPACE ENTRY PRECAUTIONS MUST BE FOLLOWED TO ENTER THE CISTERN**

### **Cleaning Procedure:**

1. Drain the cistern of water.
2. Wash the cistern with a pressure washer or a stiff brush to clean debris and sediment from all interior surfaces.
3. Rinse inside surfaces with a pressure washer or mop.
4. Remove remaining water and sludge using a mop or wet-dry vacuum.
5. Inspect for cracks or leaks on all cistern surfaces, the access hatch, and vent.

### **Disinfection Procedure:**

1. Have the cistern filled with water. Add chlorine while it is being filled according to the following: for every 450 litres (100 imperial gallons) of cistern capacity, add 0.5 litres of household bleach to yield around 50 mg/l of chlorine.
2. Open your household taps one by one until you smell a chlorine odour, then shut the tap.
3. Let the chlorine mixture stand in the cistern and piping system for at least 6 hours.
4. Drain the cistern using an outside tap connected to a garden hose. Direct the chlorinated water to an area away from vegetation to avoid damage. Because chlorine can kill fish and aquatic organisms, make certain that it doesn't drain into a lake, river, or other surface water body. Do not direct the chlorinated water to a septic tank or field: it can kill the bacteria needed to operate the septic system.
5. Have the cistern refilled and flush the plumbing system by running each faucet (including inside, outside, cold and hot water faucets, baths and showers) until you can no longer smell chlorine. Flush all toilets (one at a time).
6. Turn water heater back on.

You may have to refill the cistern a little sooner due to the use of some of the water to flush the system. If they are able to wait while you do this flushing, the water hauler can top up the cistern.

## **Inspection and Monitoring**

Cisterns must be inspected regularly to ensure the integrity of the cistern, the piping and any other related components.

Regular bacteriological sampling should also be performed to verify that bacteria are not present. Such testing should be done at least once a year. If there is a concern with the bacteriological or chemical quality of

the water, speak to the water supplier. They should be able to provide you with water quality testing results for the water. If the water upon delivery is free of bacteria and your sample comes back positive for bacteria, there may be a problem with your cistern and you should undertake cleaning/disinfection and resample. If the problem persists, speak to your water supplier as the issue may be originating from the water treatment plant or within the water hauling equipment. Until the water is deemed safe, you should follow the boil water advisory precautions available on the Office of Drinking Water website at [www.manitoba.ca/drinkingwater](http://www.manitoba.ca/drinkingwater) under “Public Information”.

For information on how to properly collect a water sample for bacteria analysis, cistern owners can visit [www.manitoba.ca/drinking](http://www.manitoba.ca/drinking) under “Public Information”, click on “Private Well Fact Sheets”, or they can contact their local Drinking Water Officer.

## Continual Disinfection of Cistern Water

If cistern water will be stored over a prolonged period of time (beyond average refilling cycle), periodically adding chlorine to the water will maintain a chlorine residual and reduce the possibility of bacteria growth (slime) within the cistern.

The table below shows how much regular household bleach to add to various size water volumes to disinfect relatively clean water (always use clean containers designed for storage of food or water). The values are based on a chlorine concentration of about 5 per cent, which is the typical concentration found in regular household bleach. Buy new containers of unscented, detergent-free bleach, as bleach can lose its strength over time. Adding household bleach (5 per cent) at these amounts will produce water with about 2 mg/l of chlorine in it.

<b>Litres of water to disinfect (equivalent shown in brackets)</b>	<b>Amount of household bleach (5%) to add</b>
2300 l (500 imp. gal.)	90 ml (6 tbsp)
4500 l (1,000 imp. gal.)	180 ml (3/4 cup)
6800 l (1,500 imp. gal.)	270 ml (1 cup)
9100 l (2,000 imp. gal.)	360 ml (1 ½ cups)
11,400 l (2,500 imp. gal.)	450 ml (2 cups)
22,700 l (5,000 imp. gal.)	900 ml (4 cups)
34,100 l (7,500 imp. gal.)	1.3 l (5 ½ cups)
45,500 l (10,000 imp. gal.)	1.8 l (7 ½ cups)

Let the water stand for at least an hour after adding the bleach before you start drinking it. If the water is colder than 10°C, let the water stand for at least two hours before drinking.

## For more information

For additional information on water cisterns, please see Canadian Standards Association (CSA) B126 Series-13 on water cisterns at [www.csagroup.org](http://www.csagroup.org).

For more information on drinking water safety, water treatment devices, or to receive a copy of other drinking water fact sheets, please visit the Office of Drinking Water website at [www.manitoba.ca/drinkingwater](http://www.manitoba.ca/drinkingwater) or contact the Private Well, Education and Outreach Co-ordinator at 204-948-1351. To locate a local office near you, please refer to the website at [www.manitoba.ca/waterstewardship/odw/reg-contacts/index.html](http://www.manitoba.ca/waterstewardship/odw/reg-contacts/index.html).

For information on certification for water treatment devices, visit [www.nsf.org](http://www.nsf.org).

For health information, contact Health Links at 204-788-8200 in Winnipeg; toll free at 1-888-315-9257 or contact your local public health office. To find your nearest public health office, go to: [www.manitoba.ca/health/publichealth/offices.html](http://www.manitoba.ca/health/publichealth/offices.html).