Rain Barrel and Cistern

Stormwater BMP Type

Pretreatment BMP	□
Infiltration BMP	□
Filtering BMP	□
Stormwater Pond BMP	□
Stormwater Wetland BMP	□
Water Quality Conveyance BMP	□
Stormwater Reuse BMP	■
Proprietary BMP	□
Other BMPs and Accessories	□

Stormwater Management Suitability

Retention	■
Treatment	□
Pretreatment	□
Peak Runoff Attenuation	■

Pollutant Removal

Sediment*	**Low**
Phosphorus	**Low**
Nitrogen	**Low**
Bacteria	**Low**

*Includes sediment-bound pollutants and floatables (with pretreatment)

Implementation

Capital Cost	**Varies**
Maintenance Burden	**Low**
Land Requirement	**Low**

Description

Rainwater harvesting involves the collection of rainwater from rooftops and other impervious surfaces and storage of the rainwater in a rain barrel or cistern for non-potable use. Rainwater harvesting practices are extremely versatile and scalable from small-scale residential applications to large-scale commercial or industrial sites. Collection systems can be located outside, inside, above or below the ground and can be designed in a variety of shapes and sizes to fit the site conditions.

Rainwater harvesting systems generally consist of five main components: catchment, conveyance, pretreatment, storage, and distribution. Catchment areas include clean roofs (rain barrels and cisterns) and other impervious surfaces (cisterns only). Pretreatment is required for larger harvesting systems (cisterns) to remove stormwater pollutants from paved surfaces and to remove leaves, debris, and other coarse solids from roof runoff. Storage can be in a prefabricated or custom-built above or below ground system, and either detached or structurally integrated with a building. Finally, distribution systems can range from garden hoses on a rain barrel, to plumbing or underground irrigation systems associated with a cistern.

Rain barrels are storage containers that are connected to a downspout and capture runoff from a roof. Rain barrels are typically sized to retain 50-100 gallons of irrigation water for gardening and landscaping. Many different types of rain barrels are commercially available. Although they primarily function as storage for stormwater reuse, rain barrels can help to control localized drainage issues and reduce the effects of small-scale point discharge, such as scour at the outlet of a roof drain system.

Cisterns have a greater storage capacity than rain barrels and may be located above or below ground. Cisterns typically collect runoff from areas larger than residential rooftops such as roof areas of larger buildings or parking lots. Stored water is fed by gravity or pumped via a distribution system to the point of use. Unlike rain barrels, cisterns can provide some peak runoff attenuation depending on the size of the system and the volume of water in the cistern at the start of a storm event.

Table 13-10. Summary Comparison of Rain Barrels and Cisterns

Feature	Rain Barrel	Cistern
Uses (non-potable)	Outdoor uses: gardening, landscape irrigation, rinsing.	Indoor and outdoor uses: landscape and turf irrigation, washing, flushing, cooling.
Size	Small; usually serve an individual roof. Typically, sufficient for 100-200 square feet of roof area.	Large; usually collect runoff from a larger area and often multiple sources.
Location	Above ground	Above ground tanks or underground storage system.
Cost	Inexpensive (Sometimes barrels can be obtained at little or no charge)	More expensive (Cost depends on materials, size, and construction method)
Requires Pretreatment or Treatment?	No	Yes
Suitable for Treatment?	No	No
Suitable for Retention?	Yes	Yes
Suitable for Peak Runoff Attenuation?	Too small to attenuate peak runoff; can have localized drainage benefits. Multiple barrels can be installed on a site to increase their effectiveness.	Can be large enough to attenuate peak flows depending on the size of the system and the amount of water stored when the storm event occurs.

Rain barrels and cisterns can provide retention credit for the volume of water captured and reused. However, they are limited in their capacity to achieve other goals such as pretreatment and infiltration. For example, neither system recharges groundwater. As stand-alone strategies, they do not provide stormwater treatment but are nonetheless ideal for capturing, collecting, and reusing stormwater for non-potable uses such as irrigation, vehicle washing, or toilet flushing. Providing an alternate source of water for those activities can lower demand on public and private water supplies, which is especially beneficial during dry spells in summer months.

Additionally, rain barrels and cisterns can be an important component of a more complex stormwater management system. For example, the overflow from rain barrels and cisterns can be directed to a dry well or other infiltration BMP to provide groundwater recharge and additional retention. Including a cistern in a stormwater treatment train can also increase the overall capacity of the system.

Advantages

- Conserve potable water for essential uses.
- Provide alternative to potable water during time of peak demand.
- Reduce or limit withdrawals from ground or surface water supply.
- Effective method for capturing runoff for a variety of uses, especially in areas where public water supply is limited.
- Efficient use of space in urban areas and for retrofits.
- Cisterns can be sized to fit small to large scale needs.
- Quick installation using prefabricated modular systems.
- Systems are durable with a long life with effective pretreatment and routine maintenance.
- Suitable for use as part of a stormwater treatment train, particularly in combination with off-line retention and treatment stormwater BMPs.
- Rainwater is typically soft compared to other sources of water and contains low levels of dissolved salts and minerals which makes it preferable for irrigation, gardening, and landscaping uses. Soft water can also be less taxing on plumbing if the water is harvested to supply flushing, car washing, or other non-potable uses.

Limitations

- Strictly for stormwater reuse and limited quantity control. Not suitable for treatment.
- Rain barrels and smaller cisterns have minimal impact on runoff volume and peak flows.
- Capture and reuse of stormwater from paved surfaces and some roof surfaces requires appropriate pretreatment, as well as additional post-storage treatment for certain uses, which can add cost and complexity to the system.
- Deteriorated and/or clogged gutters and downspouts can cause a system to fail.
- Underground cisterns can require extensive, costly excavation.

Siting Considerations

- **Drainage Area:** A single 55-gallon rain barrel can generally serve a roof area of 100 to 200 square feet depending on how frequently the stored water is used for irrigation. Cisterns

can be used to store runoff from larger drainage areas, including rooftops and other impervious surfaces, generally up to 1 acre or more depending on the water demand.

- **Groundwater and Bedrock:** No restrictions. Anti-buoyancy measures may be needed for underground cisterns at or below the water table.

- **Land Uses:** Rain barrels are applicable to a wide range of land uses (i.e., residential, commercial, industrial, municipal, institutional) where reuse for gardening or landscape irrigation is desired. Cisterns are typically used in land use settings with larger water demand such as commercial, institutional, and industrial facilities.

- **General:** Both rain barrels and cisterns should be located as close as possible to the source and/or point of use. This minimizes the infrastructure required to convey the water to the system and distribute it where it is needed. To function effectively, rain barrels and cisterns should be sized according to the on-site water needs. An over-sized system will not be drained sufficiently to accommodate input during rain events and an under-sized system will not meet the water needs for the site.

Soil Evaluation

- A soil evaluation is not required for rain barrels.

- A soil evaluation is required for all subsurface rainwater harvesting storage systems and may be required for large aboveground storage tanks to evaluate the need for a foundation (i.e., crushed stone and/or concrete or concrete block) to support the weight of the tank when full and to prevent the cistern from settling, overturning, or incurring other damage.

- Conduct an evaluation of the soil characteristics and subsurface conditions at the location of the proposed cistern including soil type, depth to the seasonal high groundwater table, depth to bedrock, and other geotechnical testing as necessary. Perform test pits or soil borings in accordance with the soil evaluation guidance in Chapter 10 - General Design Guidance for Stormwater Infiltration Systems.

Design Recommendations – Rain Barrel

- Rain barrels are typically located at the downspout of a roof gutter system.

- Place the rain barrel on a sturdy, level surface 1-3 feet above the ground. The surface or platform should be capable of supporting the barrel when it is full, which for a standard 55-gallon rain barrel can be between 400 and 500 pounds. Elevating the barrel increases the water pressure and facilitates drainage.

- Install an overflow pipe from the top of the barrel to an Infiltration BMP, Filtering BMP designed for infiltration, or onto a vegetated surface consistent with the requirements for

simple disconnection as described in Chapter 5 - Low Impact Development Site Planning and Design Strategies of this Manual.

- A single 55-gallon rain barrel can typically serve 100 to 200 square feet of roof area depending on the water needs for gardening or landscape irrigation. Use multiple rain barrels if larger volumes are desired. Calculate the volume of stormwater runoff generated for a given storm and roof area using the following equation:

$$V = \frac{A * P * 0.9 * 7.5}{12}$$

where:

V = required volume of rain barrel (gallons)
A = surface area of roof (square feet)
P = rainfall (inches)
0.9 = losses to system (no units)
12 = conversion factor (inches per foot)
7.5 = conversion factor (gallons per cubic foot)

Example: One 60-gallon rain barrel would provide sufficient storage from a rooftop area of approximately 100 square feet for a 1.0-inch storm, assuming that the rain barrel is empty prior to the storm.

$$V = \frac{100\ ft^2 * 1.0\ in * 0.9 * 7.5\ gal/ft^3}{12\ in/ft} = 56.25\ gallons$$

- Pretreatment of stored rainwater is typically not required for gardening or landscape uses.
- If there is a downspout from the roof and it extends to the ground, use a downspout diverter to divert water to the top of a "closed-top" rain barrel.
- If the downspout is cut a few feet above the ground use a plastic, flexible gutter extension or elbow to connect to top of an "open-top" rain barrel.
- If there isn't a downspout, a rain chain can be used to connect the roof to the top of an "open-top" rain barrel.
- A filter system, such as a screen, can be installed as a part of the connection to prevent sediment and debris from entering the barrel.
- Cover the top of the barrel with a tight-fitting, light-blocking, locking lid that will keep the lid from blowing off in a storm, keep children and animals out of the water, limit the development of algae, and limit access to the standing water for mosquitos.

- Cover all openings into the barrel with window screening that is tightly affixed, or even caulked, at all edges. A screen can be added under the lid as an extra precaution.
- Provide a spigot, with garden hose threading, a few inches (minimum) above the bottom of the rain barrel to create a sump for sediment and debris on the bottom of the barrel. A regular garden hose can be connected to the spigot. Use a garden hose that is at least 8-10 feet long to discourage mosquitos from flying up the hose. The end of the hose can be fitted with screen to further prevent intrusions.
- Disconnect and drain rain barrels in the winter to prevent freezing and deformation of the rainwater harvesting system.

Design Recommendations - Cistern

The selection and design of stormwater cisterns and larger rainwater harvesting systems depends on many factors including the size and characteristics of the contributing drainage area; the volume, timing and location of water use on the site; physical and operational site constraints; system costs versus anticipated water savings; operation and maintenance considerations; and other factors. Cisterns come in many configurations and sizes, and the design of stormwater cisterns is highly site-specific. Table 13-14 provides a summary comparison of various types of cisterns. System design should be consistent with design guidance of the product manufacturer as well as local and state building and public health codes regarding beneficial reuse of rainwater or stormwater.

Table 13-11. Comparison of Types of Rainwater Harvesting Storage Systems (Cisterns)

Type/Material	Advantages	Disadvantages
Fiberglass and Fiber Reinforced Polymer	➢ Economical storage solution for larger volumes of water ➢ Protection from UV sunlight degradation ➢ Available in a variety of sizes and capacities ➢ Provides strength and durability for reliable performance ➢ Material is inert to soil compounds which can degrade tanks manufactured with other materials ➢ Accessible for maintenance, minimal maintenance	➢ Expensive in smaller sizes ➢ Excavation for cistern can be difficult ➢ Can be expensive to ship
Polyethylene, Polypropylene, & HDPE Pipe	➢ Commercially available ➢ Alterable and movable ➢ Affordable ➢ Available in a variety of sizes ➢ Easy to install & Accessible for maintenance, minimal maintenance	➢ Can be degraded by UV sunlight if aboveground ➢ Can detract visually if not well-sited
Plastic (Aboveground) Cistern	➢ Commercially available ➢ Alterable and movable ➢ Available in a variety of sizes, shaped, configurations, colors ➢ Easy to access for maintenance	➢ Possible UV deterioration ➢ Aboveground use only ➢ Must be insulated & heat traced for year-round use ➢ Can detract visually if not well-sited ➢ Can be expensive to ship
Galvanized Metal	➢ Commercially available ➢ Alterable and movable ➢ Available in a variety of sizes, shapes, configurations ➢ Easy to access for maintenance	➢ Possible corrosion and rust ➢ Aboveground use only ➢ Must be insulated and heat traced for year-round use ➢ Can detract visually if not well-sited ➢ Can be expensive to ship
Concrete	➢ Can be economical storage solution for larger volumes of water ➢ Long life ➢ Load bearing capabilities for use under parking lots and driveways ➢ Can be configured in custom shape and layout ➢ Can neutralize slightly acidic rainwater ➢ Can be made accessible for maintenance	➢ Expensive in smaller sizes ➢ Excavation for cistern can be difficult ➢ Precast concrete cisterns are not readily available & may involve expensive shipping costs ➢ Susceptible to cracks & leaks over time (install liner inside tank)
Modular (Plastic Lattice) Storage Systems	➢ Can be economical storage solution for larger volumes of water ➢ Low shipping cost compared to other system types ➢ Flexible in shape, layout, and depth ➢ Available in a variety of sizes and capacities ➢ Units can be specified for traffic loading for use under parking lots & driveways ➢ Provides strength and durability for reliable performance	➢ Requires specific excavation and burial preparation to ensure longevity of system ➢ Internal cleaning is not possible; pretreatment system is extremely important for system longevity

Water Budget Analysis

- Perform a water budget analysis to determine if the desired capture volumes can be achieved and to properly size the system. A water balance consists of estimating the amount of water that can be captured and the amount of water that is used. Key considerations include balancing the amount of storage unit overflow with the size of the storage unit and limiting or eliminating the need for a secondary water supply.
- Estimate the water budget using a daily time step, mass balance approach. Daily changes in storage volume are equal to watershed runoff inputs minus evaporation, overflow, and indoor/outdoor use outputs.
- Water budget calculations can be performed using a water balance calculator specifically designed for rainwater harvesting systems, other models, or a spreadsheet.
- Water demand for irrigation is determined based on irrigation rates and water needs of the landscaped or turf area

Siting

- Located the cistern as close as possible to the water collection and/or point of use.
- Locate the cistern upslope from the point of use, if possible, to maximize gravity flow to the point of use.
- Locate the cistern below ground, if possible, to avoid freezing in the winter.
- Co-locate the cistern with building foundations, where possible.
- Grade away from the cistern; avoid low points where a cistern can become flooded.
- Direct cistern overflow away from an adjacent structure's foundation.
- Locate the cistern upslope from any sewage disposal facilities, septic tanks, or other source of potential contamination.
- Where possible, do not locate cisterns under areas with high vehicle loading. If unavoidable, design the structure to support the vehicle load.

Pretreatment

- Pretreatment is required to extend the functional life of a cistern. Incorporate pretreatment measures at locations where runoff enters the cistern in accordance with the Pretreatment BMPs section of this Manual.
- Pretreatment measure(s) should treat at least the Water Quality Flow (WQF).

- Acceptable pretreatment measures depend on the characteristics of the drainage area.
    - **Runoff from Paved Areas:** Pretreatment of runoff from paved areas includes pretreatment measures that are suitable for piped drainage systems – deep sump hooded catch basins,[88] oil grit separators, and proprietary pretreatment devices.
    - **Roof Runoff:** For runoff from roofs with low potential for accumulation of leaves or other solids, pretreatment may be waived by the reviewing authority. For roofs with moderate or high potential to collect leaves or other solids (e.g., roofs that are lower than the surrounding trees), pretreatment is required to remove coarse solids from the runoff prior to entering the cistern. Pretreatment options for roof runoff include leaf screens, first flush diverters, or roof washers.
- Additional treatment of the stored water may be necessary prior to use depending on the water quality requirements of the proposed use.

General Design Considerations

- The cistern should have sufficient storage volume to contain the Water Quality Volume (WQV) without overflow.
- The demand for stormwater reuse on site should be sufficient to empty the cistern within 72 hours after a rain event in order to allow for sufficient storage for the next rain event. Additionally, storage in excess of 72 hours may result in anaerobic conditions, odor, and both water quality and mosquito breeding issues.
- If the lowest 3-day water demand is insufficient to empty a cistern sized for the water quality storm, but the demand is greater on other days, a secondary storage tank should be used, sized with sufficient capacity to hold water from each storm event until it is reused.
- Cisterns can be constructed as off-line or on-line systems. In an off-line configuration, runoff from storms larger than the water quality storm bypasses the cistern through an upgradient diversion. On-line systems receive runoff from all storm events, which can be used or pumped to a secondary storage tank for later use. Runoff from larger storm events is conveyed through an overflow. On-line systems can also provide some stormwater runoff quantity control.
- Aboveground cisterns should be insulated to prevent the contents from freezing in the winter, or the cistern and rainwater harvesting system should be drained in the winter and only used seasonally. Aboveground cisterns should be covered to avoid becoming a breeding ground for insects.

[88] Only recommended for space constrained sites where no other Pretreatment BMPs are feasible.

- Underground cisterns should be located 3 feet below grade (or below the frost line) to prevent the harvested rainwater from freezing. For underground installations, the cistern should be at or above the seasonal high groundwater table (SHGT) and bedrock. Anti-buoyancy measures may be needed if cisterns are designed at or below the water table.

- When installing a cistern on a rooftop, consider the weight of the cistern at full capacity to be certain the roof structure is designed to accommodate the full load.

- To find the minimum required elevation of a cistern, calculate the hydraulic head required to distribute the water to the point of use. If the cistern cannot be located at that elevation, then pumps are required to distribute the water.

- All cisterns should include a vent pipe. The vent is necessary to allow fresh air to circulate in the cistern and it should be installed so that the opening faces the prevailing wind. Provide a water-tight seal where the vent pipe penetrates the cistern.

- All cisterns should include an overflow pipe. The diameter of the overflow pipe should be at least as large as the diameter of the inflow pipe. Install a fine-mesh screen on the end of the vent and overflow pipes to prevent the incursion of animals and insects. The overflow should discharge to an Infiltration BMP, Filtering BMP designed for infiltration, or onto a vegetated surface consistent with the requirements for simple disconnection as described in Chapter 5 - Low Impact Development Site Planning and Design Strategies of this Manual. The cistern may be designed to continuously discharge water at a very slow rate so that there is capacity in the cistern to retain stormwater in subsequent rain events.

- The water line from the cistern to the point of use should be buried below the frost line, be located at least one foot above the floor of the cistern and be positioned on the opposite side of the cistern from the input pipe to allow for sediment to settle.

- A separate input pipe can be included if water needs to be added to the cistern from a source other than captured stormwater.

- Provide a backflow prevention system to prevent contamination of public water supplies when public water is used as a backup source of water.

- Include sufficient freeboard above the outlet to allow for large storm events to pass through the cistern without backing up in upstream pipes or spilling out onto nearby surfaces.

- For cistern systems where controls to automate or regulate flow are required to move water from the cistern into the distribution system, include methods for detecting flows, identifying system failure (i.e., high level alarm) as well as an emergency shut-off and emergency backup power.

- All cisterns should include a cleanout drain for system cleaning. Slope the floor of the cistern towards the cleanout drain to facilitate cleaning. The drain cover can be controlled

by a valve that is either controlled from ground level or directly. The drain line and valve to control the drain cover will both need to be buried below the frost line to avoid freezing. The drain line should be sized adequately to move sediment that builds up in the cistern. A 4-inch diameter pipe is typically sufficient.

- Provide access manholes for system maintenance. Manholes should be placed, at a minimum, near the inlet and outlet of the system and in intermediate locations. The number of manholes depends on maintenance methods and design guidance of the product manufacturer.
- Custom concrete cisterns should be a minimum of 6 inches thick and reinforced with steel rods.
- When using prefabricated units follow the product manufacturer guidelines for installation requirements, minimum cover, and bedding/foundation design below the structure to support the design load associated with the structure, water storage, and adjacent backfill weight.
- If a liner is used for underground modular storage systems, the liner should consist of a 30 mil (minimum) HDPE or PVC liner, or one of the alternative liner systems described in Chapter 10 - General Design Guidance for Stormwater Infiltration Systems with the approval of the review authority.

Construction Recommendations

Rain Barrel

- Commercially available rain barrels can be installed quickly by placing the rain barrel on a sturdy, level, elevated platform and connecting it to a downspout.
- Use a food-grade container for the barrel, if possible, to prevent harmful chemicals from leaching into the stored rainwater.
- When drilling holes into the rain barrel, make the orifice fit the attachments as close as possible. Ragged edges can create openings for mosquitos and other insects to enter the rain barrel.
- Teflon tape can be used to fill spaces between the threads of any fittings and the barrel to create a water-tight seal. Wrap the tap clockwise to prevent it from coming undone when the adapter is screwed into place.
- Use washers on the inside and outside of each fitting attachment to ensure a snug fit.
- Caulk or plumbing adhesive can be used to seal the fittings.

Cistern

- The designing qualified professional should develop a detailed, site-specific construction sequence.
- The designing qualified professional should inspect the installation during the following stages of construction, at a minimum:
    - After excavation of the system (underground systems)
    - After placement and leveling of any necessary bedding or foundation below the cistern
    - After placement of the cistern(s) and any pretreatment devices and secondary storage tanks
    - After the installation of bypass, outlet/overflow, and inlet controls
    - After connection of the cistern and harvesting system to secondary water sources
    - After the system has been backfilled (underground systems)
- The designing qualified professional should provide an as-built plan of the completed system along with a certification that the system was designed in accordance with the guidance contained in this Manual and other local or state requirements and that the system was installed in accordance with the approved plans.
- The entire contributing drainage area should be completely stabilized prior to directing any flow to the system. Adequate vegetative cover must be established over any pervious area adjacent or contributing to the system before runoff can be accepted.
- Erosion and sediment controls should be in place during construction in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control and the Soil Erosion and Sediment Control (SESC) Plan developed for the project.
- The system should be fenced off during the construction period.
- The system should be excavated to the dimensions, side slopes, and elevations shown on the plans.

Maintenance Needs

Rain Barrel

- Detailed inspection and maintenance requirements, inspection and maintenance schedules, and those parties responsible for maintenance should be identified on the plans and in the Stormwater Management Plan.
- Maintenance should be detailed in a legally binding maintenance agreement.
- Sediment and debris should be cleaned out on a regular basis.

- Use a screw-on lid, whether it is a solid or screened lid to facilitate easy access for maintenance.
- Gutters on the roof should be kept clear of debris to limit the amount of stormwater that reaches the rain barrel or could contribute to a build-up of debris in the rain barrel that limits its performance.
- Winterization is required to limit damage to the barrel from freeze-thaw cycles. Drain the barrel and store it upside down for the winter.
- Before reconnecting it to the downspout in the spring, clean the barrel with a nontoxic cleaning solution, check all of the connections, and make any necessary repairs.
- Inspect the roof catchment area for leaves or particulate matter that may be entering the gutter and downspout to the rain barrel.
- Inspect the gutters, downspouts, and entrance to the rain barrel for leaks or obstructions.
- Inspect the rain barrel for potential leaks, including barrel top and seal.
- Inspect the overflow pipe for erosion at the outlet.
- Inspect the spigot to ensure that it is functioning correctly.
- Drain and disconnect the system before winter to prevent freezing and cracking.
- Mosquito larvae can form in rain barrels when water is retained over 72 hours. The larvae need to be at the surface to breathe so controlling the growth of mosquitos at this stage is manageable. Adding a tablespoon of non-toxic liquid dish soap after a storm or even on a weekly basis will add a film on the top of the water that will break the surface tension of the water and make it impossible for adults to lay eggs. Another strategy is to add ¼ cup of vegetable oil can be added weekly or after storm events. The oil forms a film on top of the water that prevents the larvae from breathing.
- Cleaning with a diluted bleach solution periodically can help remove any available food for the mosquito larvae and it makes the barrel less attractive to adults looking to lay eggs.

Cistern

- Detailed inspection and maintenance requirements, inspection and maintenance schedules, and those parties responsible for maintenance should be identified on the plans and in the Stormwater Management Plan.
- Maintenance should be detailed in a legally binding maintenance agreement.
- Maintain underground structures in accordance with the manufacturer's guidelines.

- Typical maintenance includes removal of accumulated oil and grease, floatables, and sediment from the pretreatment structure using a vacuum truck and removal of accumulated sediment from the cistern using a high-pressure water nozzle (i.e., JetVac process) and vacuum truck.
- Confined space safety procedures as required by OSHA regulations must be followed by workers entering an underground cistern.
- Inspect the pretreatment structure and cistern twice a year.
- Inspect the remainder of the system annually including an inspection for material failure (such as cracking, spalling, deterioration, subsidence, etc.).
- Pumps, valves, alarms, and other controls should be kept in good working order in compliance with the manufacturer's guidelines.
- Refer to Appendix B for maintenance inspection checklists, including items to focus on during inspections.
- Remove sediment from the pretreatment structure when it accumulates to more than 50% of the design depth.
- Remove sediment from the cistern when the sediment accumulation exceeds 2 inches throughout the length of the structure.
- Because rainwater is acidic and therefore corrosive, measures should be taken to neutralize rainwater in cisterns. Using plastic pipe can reduce corrosion or a neutralizing agent, such as limestone, quick lime, hydrated lime, soda ash, or caustic soda, can be added directly to the cistern.
- During winter months, downspouts, pretreatment mechanisms, and outflows should be periodically checked for ice buildup and all ice removed to keep the system functioning. It is sometimes economical to add heat trace to the piping in larger stormwater harvesting installations.

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