4.3.2 Rainwater Harvesting/Cistern Credit

Definition of Rainwater Harvesting/Cistern Credit

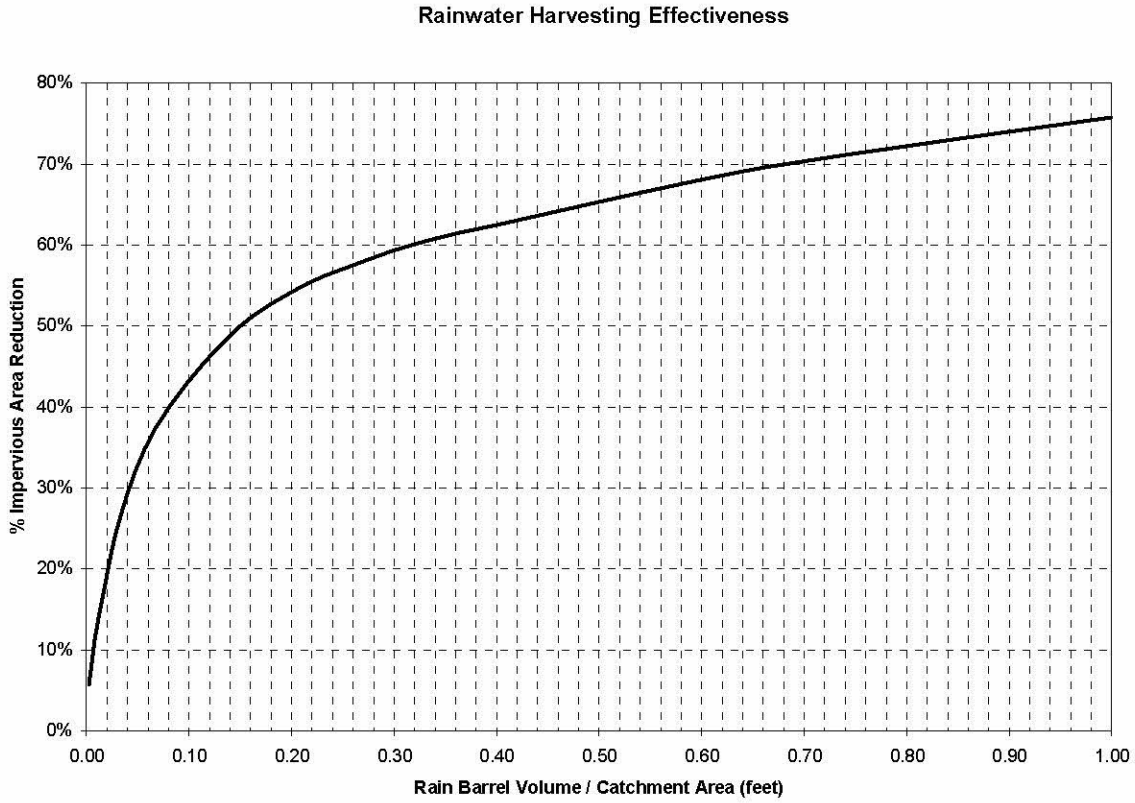
A credit is given when rainwater collection systems are used to retain roof runoff resulting in the reduction of the development impervious cover. Rainwater collection systems will generate an impervious cover reduction for the area that drains to the rainwater collection barrel(s) based on the ratio of the barrel volume to the roof (catchment) area. Rainwater collection can occur at single family residences, multi-family complexes, and commercial developments. This credit can be used to gain compliance with the Alternate Standards or reduce the water quality volume. The maximum impervious cover reduction is 75% to account for rainwater system maintenance and operation challenges that may occur over the system life.

Rainwater collection can also be used to satisfy the roof-top disconnection credit, but can not be counted as a credit for both rainwater harvesting and roof-top disconnection.

Reduced impervious cover credit is computed per the following equation and figure:

$$\mathbf{A_r = A_{RT} * \%_{IC\ REDUCTION\ FACTOR}}\ \textbf{(per Figure below)}$$

Where:
A_r = Allowable reduction in impervious cover
A_{RT} = Area of roof-top directed to rain barrel(s) (catchment area) (sq ft)
$\%_{IC\ REDUCTION\ FACTOR}$ = % Impervious area reduction
RBV = Rain barrel volume (cubic feet)



Rainwater Collection Credit

Restrictions on the Credit
The rainwater harvesting credit is subject to the following restrictions:

- Rainwater collection and distribution systems must be designed and installed per the requirements in this Section;
- A rainwater collection system maintenance plan must be approved by LCRA before issuance of a development permit. The maintenance plan will need to identify the responsible maintenance party and allow for periodic LCRA inspection;
- The development permit will include a condition that the contractor must contact LCRA 48 hours prior to the final completion of the rainwater collection system;
- Storage shall be provided in cisterns, rain barrels, tanks, or other approved methods.
- Overflows from rainwater tanks should be diverted to grassy swales and/or lawns to promote infiltration of excess runoff volume.

Example calculation, the required water quality volume before the credit for a ten (10) acre site with 30 single family lots would be:

Impervious cover = 3 acres = 30%
1-year runoff volume = 0.59 inches based on Equation 2.9
Water quality volume = (0.59 inches) * (10 acres) * (43,560/12) = 21,417 cubic- feet.

Applying the credit, each single family lot will utilize a rainwater collection system per the criteria. Each house has a roof area of 2,000 square feet, however, individual roof design is not known at this phase, thus a factor of 0.75 is applied to the roof area, resulting in the assumption that 1,500 square feet can be drained to rainwater collection tanks. The home storage barrel(s) will provide 1,500 gallons of storage.

Roof area draining to collection barrels = 2,000 square feet * 0.75 = 1,500 square feet
Barrel volume = 1,500 gallons per plat note and deed restriction = 200 cubic feet
Barrel volume to catchment area = 200 / 1,500 = 0.13
Using the Rainwater Harvesting Effectiveness Figure, % IC Reduction = 43%
A_r = Allowable impervious cover reduction per house = (1,500) X (0.43) = 645 square feet
Impervious cover with credit = (3 acres) – ((30 lots) * (645 sq. ft)) = 2.56 acres
Effective impervious cover = 26%
1-year runoff volume = 0.52 inches based on Equation 2.9
Water quality volume = (0.52 inches) * (10 acres) * (43,560/12) = 18,876 cubic-feet.

The BMP water quality volume is reduced by 12% in this example.

Description

Rainwater harvesting is a method of diverting and collecting rainfall that falls onto impervious surfaces, such as roofs. Harvested rainfall is typically used for indoor residential use, landscape irrigation, or both. By capturing and slowly releasing rooftop runoff over vegetated areas, rainwater harvesting can reduce stormwater volume and flow rates and the resultant erosion and pollutant discharges to surface waters. Schematics of a complex rainwater harvesting system are presented in Figures 4.21 and 4.22 below.

Application

In a rooftop rainwater harvesting system, runoff flows via gravity through gutters and downspouts into a storage tank where it is slowly released to landscaped areas or stored for later use. Rainwater harvesting systems are primarily designed for conservation—long-term storage and use—rather than to mitigate the impacts of impervious cover and increased runoff. If a tank is full or near-full (beneficial for conservation and long-term use) it will not provide stormwater benefits.

Rainwater harvesting systems can provide pretreatment for other BMPs and qualify for stormwater credit to reduce water quality basin size or gain compliance with the Alternate Standards. The collection systems are equally appropriate in large-scale landscapes, such as parks, schools, commercial sites, parking lots and apartment complexes and in small residential landscapes. Rainwater harvesting is a feasible alternative for intensively developed areas and is suitable for steep terrain and flat landscapes where collected water can be diverted to depressed landscaped areas or grassy swales.

Rooftop rainwater harvesting provides a lower-cost method of treating surface water runoff than other permanent water quality treatment structures. Costs include the storage tank, filtering system, and pressure pump. Routine maintenance is a minor expense but is essential for the system to properly function. In an effort to encourage water conservation, the State provides financial incentives and tax exemptions to offset the equipment costs. Municipal incentives are also available in some areas.

Additional information can be found in the Texas Rainwater Harvesting Manual.

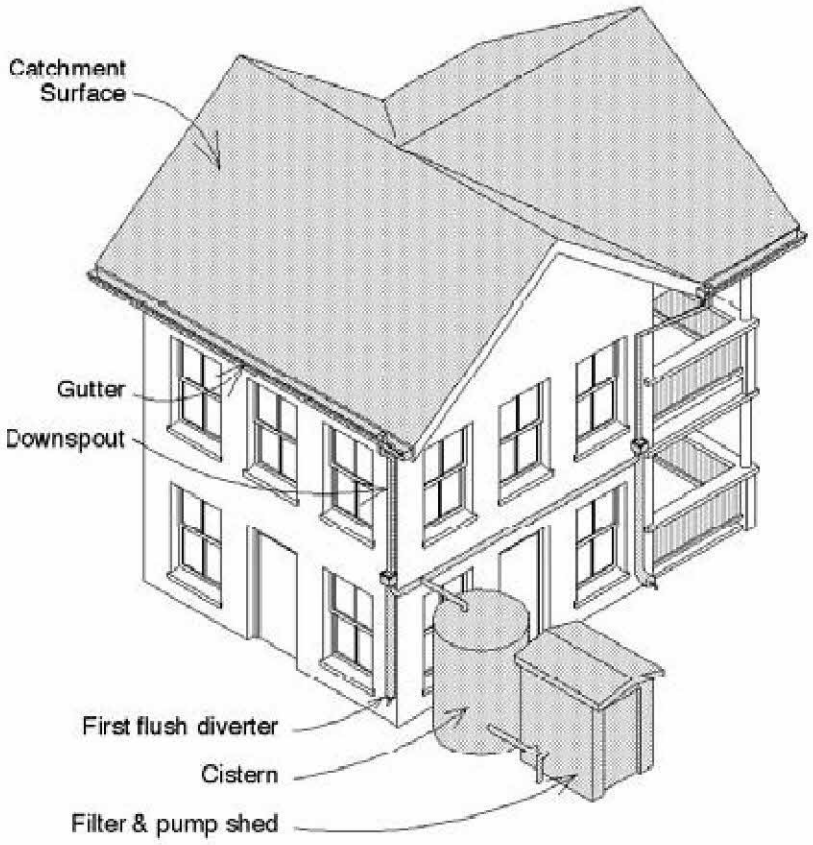


Figure 4.20: Complex water harvesting system with roof catchment, gutter, downspout and storage tank. (City of Austin Energy's Green Building Fact Sheet, 1995)

Design Guidelines

Rainwater Harvesting is a system of collecting, conveying, and storing rainfall from impervious surfaces and directing water to where it is needed.

(1) *Catchment surface*: The collection surface is the "footprint" of the roof. The effective collection surface is the length times the width of the roof from eave to eave and front to rear.

(2) *Conveyance systems*: Gutters should be properly sized and located to maximize catchment efficiency and prevent overrunning. Overrunning can result from an inadequate number of downspouts, excessively long roof distances from ridge to eave, steep roof slopes, and inadequate gutter maintenance. Preventative strategies may include modifications to the size and configuration of gutters and addition of gutter boxes with downspouts and roof diverters near the eave edge. Gutters should slope towards the downspout with the outside face of the gutter lower than the inside face to encourage drainage away from the building wall. Downspouts should provide 1 square inch of downspout opening for every 100 square feet of roof area. The first flush runoff should outfall onto an adequately sized rock splash pad that will prevent erosion, channeling, or puddling.

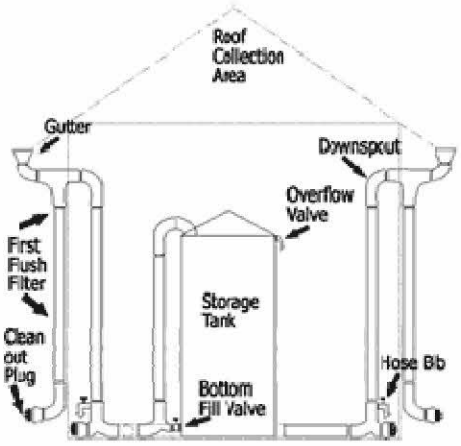


Figure 4.21: Complex water harvesting system with roof catchment, gutter, downspout and storage tank. (City of Austin Energy's Green Building Fact Sheet, 1995)

(3) *Storage*:

i. *Filtration*: Leaf screens, first-flush diverters, and roof washers should be installed on inflow lines to prevent trash and organics from entering the storage area. Permanent openings must be screened to prevent insect infestation in the piping and standpipe.

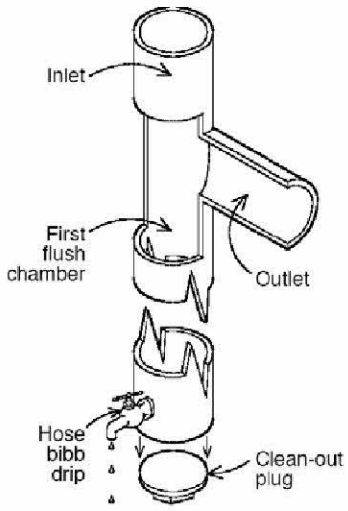


Figure 4.22: Standpipe first flush diverter. The recommended diversion of first flush ranges from one to two gallons of first-flush diversion for each 100 square feet of collection area. (TWDB, 2005)

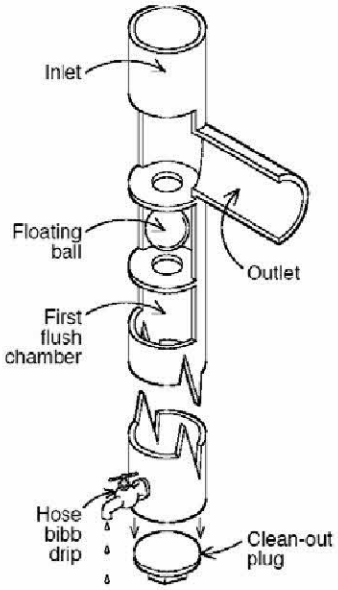


Figure 4.23: Standpipe with ball valve. The standpipe with ball valve is a variation of the standpipe filter. As the chamber fills, the ball floats up and seals on the seat, trapping first-flush water and routing the balance of the water to the tank. (TWDB, 2005)

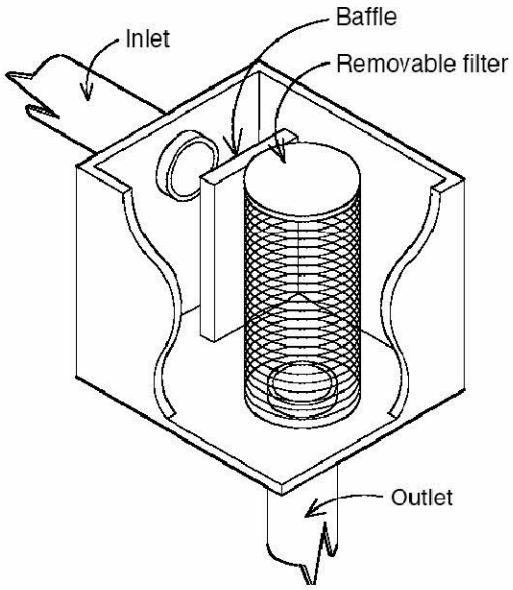


Figure 4.24: Box roof washer. Roof washers are recommended for drip irrigation systems. (TWDB, 2005)

(4) *Delivery system*: The distribution directs water to plants from storage tanks to garden hoses, constructed (non-erosive) channels, or manual drip systems. Drip and other types of integrated distribution systems may require a small pressure pump to distribute the water. If a drip irrigation system is not used, the water can gravity-flow to garden hoses. In addition, the water can be delivered to the house for domestic use.

(5) *Stormwater Credits*: Stormwater credit is given when rooftop runoff is collected, stored per the volume requirements, and discharged through everyday consumption. The figure above illustrates the percentage of impervious cover reduction that can be obtained using the above listed criteria. The percentage of impervious cover reduction is based upon the percentage of rooftop runoff that is captured. A maximum reduction of 75% of the rooftop impervious cover will be given. Credit is documented at the concept plan stage. Criteria for the rainwater harvesting system must be included in the deed restrictions to be eligible for the stormwater credit.

(6) *System Maintenance*: The system should be checked annually and after every rainfall to insure the system is operating optimally. The following maintenance should be conducted:

- Keep debris out of holding areas;
- Remove collected debris from the first-flush diversion standpipe after each rainfall event;
- Control and prevent erosion; block and repair erosion trails;
- Keep debris out of gutters and downspouts;
- Control and prevent erosion; block and repair erosion trails;
- Flush debris from storage container bottoms;

- Clean and maintain filters, especially those on drip irrigation systems;
- Expand watering basins as plants grow; and
- Roof washers must be readily accessible for regular maintenance.

4.3.3 Soil Amendment and Conservation Landscaping Credit

Definition of Soil Amendment and Conservation Landscaping Credits

A credit is given when lawns and landscape areas within the development utilize the Soil Amendment or Conservation Landscaping guidance in this section. The benefit of these designs over more traditional lawns is the placement of sufficient soil depth and appropriate vegetation that promotes infiltration and less stormwater runoff.

The Soil Amendment Credit relies on native soils, appropriate soil depths, and low maintenance turf grasses to reduce the runoff volume. **The stormwater credit for Soil Amendment is the reduction of project impervious cover by 2%.**

The Conservation Landscaping Credit is based upon planting a reduced turf area and incorporating native plants, shrubs, trees and perennials to retain stormwater on site and require minimal chemicals to sustain a native and colorful landscape. **The stormwater credit for Conservation Landscaping is the reduction of impervious cover by 5%.**

These credits can be used to gain compliance with the Alternate Standards or reduce the water quality volume.

Soil Amendment Credit

$$\mathbf{A_r = A_D * 0.02}$$

Where: A_r = Allowable reduction in impervious cover
A_D = Area of development

Restrictions on the Credit
The soil amendment credit is subject to the following restrictions:

- Home-builders coordinate with LCRA during soil placement. This coordination will be identified as a permit condition and will allow LCRA to inspect the soil depth and quality prior to grass placement.
- The soil amendment requirement shall be noted on the plat and included in the development deed restrictions.

Example calculation, the required water quality volume before the credit for a ten (10) acre site with 30 single family lots would be:

Impervious cover = 3 acres = 30%
1-year runoff volume = 0.59 inches based on Equation 2.9