Towards Best Practices in for improving Water Quality in Rainwater Harvesting Systems

Antigua and Barbuda Model

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Background

Several reasons for the long tradition of RWH in Antigua and Barbuda

- No Public water supply
- Augment public water supply
- Taste and aesthetics
- Others?

Traditional usage of rain water

- Mainly potable purposes- cooking, drinking etc.
- Watering plants
- Washing- Has superior lathering quality over pipe borne water because of the low total dissolved solids (very soft)
- Others?

Types of catchments

- Buckets
- Oil drums
- Galvanize tanks
- Plastic tanks
- Concrete underground cistern
- Others?

Challenges

- Unwanted particles out of water
- Unwanted Microorganisms – Public Health Department always found high levels of coli forms in water catchments.
- Insects and vermin – mosquitoes, roaches and now the Cuban frog
- Bird and lizard droppings
- Others

Methods of preventing extraneous matter

Several methods have been used to minimize extraneous matter entering into catchments These include

- Gauze in roof gutter at the junction with the upper section of the down spout
- Gauze at the inlet of the catchment
- Cloth on drums and tanks
- First flush system
- Settling in storage system

Issues with screening

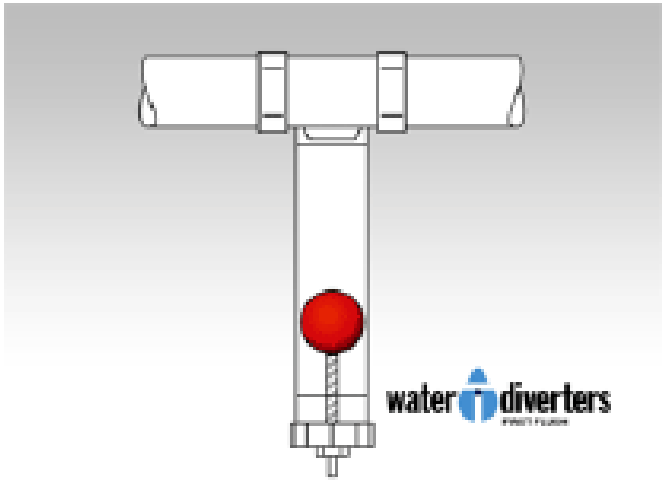
- Gauze that is located in the roof gutter are hard to reach
- A significant amount of contaminants still reaches the storage container since they are smaller than the pore sizes in the gauze
- Cloth on large tanks require significant effort to remove and replace
- Cloth does a better job in removing smaller particles. However, significant amount of micro-particles and bacteria still get into storage system.
- Dissolved solids and other chemicals cannot be removed by physical screening.

First flush concept

The first flush of water from the roof can contain amounts of bacteria from decomposed insects, bird and animal droppings, sediments, possible water borne heavy metals and other chemical residues and other undesirable elements to have in a water storage system.

A first flush system is designed to allow the first portion of water derived from a storm to be blocked from or diverted away from the storage system

Example of first flush system



- Designed to be fully automated without mechanical parts
- However, it has its draw backs

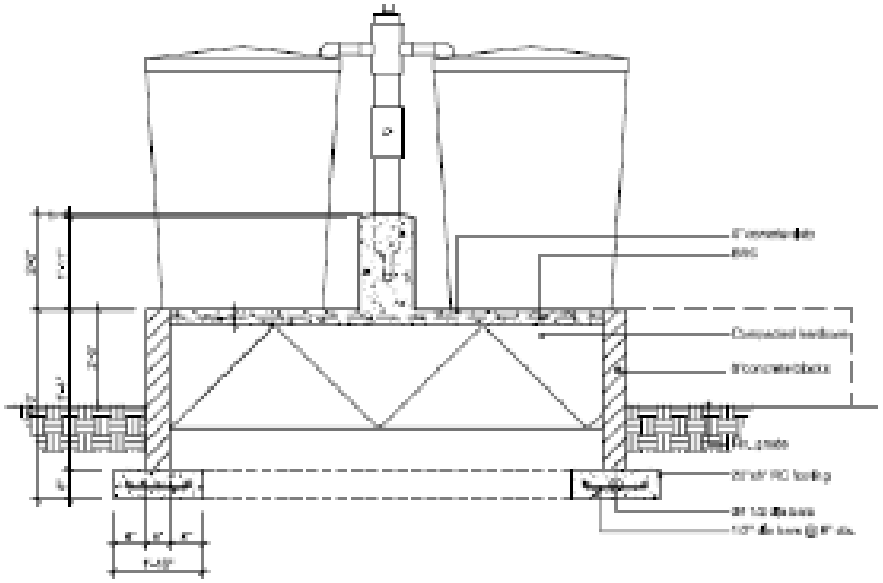
Settling in Storage System

- Particles do settle out to
- The draw off point is usually placed above the zone of settling
- However, as the particle builds up in the storage vessel, the get closer and closer to the draw off point.
- The thicker the settling zone the greater the potential for the particles to get into the water that is drawn off for use
- Remember these particles will include bacteria that are harmful to human health
- Water containing particles is more difficult to treat

Objective of new design

- Combination of first flush with filtering system as it seeks to prevent extraneous matter from entering the storage system
- It provides screening from insects and also prevent mosquito breeding
- It is not totally Automatic as the first flush system. However, it provides less involved methods of cleaning than traditional screening

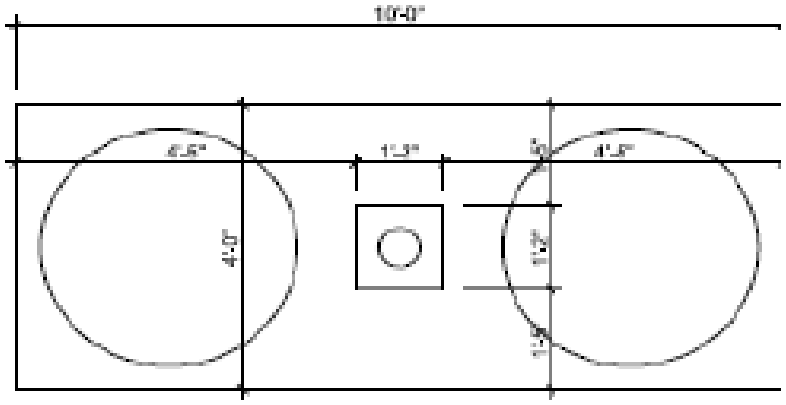
New design



Longitudinal section A

CONCRETE BASE

Plan view



Plan above base

Design Consideration

- Quantity of water need to store
- Particle sizes to be screened
- Height of roof in relation elevation of storage system
- Cost
- Availability of material

Summary

- The first flush/filter system is aimed at improving the water quality collected from roof gutters.
- It is important that householders/owners understand that it is not a totally automated system and that a level of involvement is necessary for the smooth operation of the system to meet the objectives.
- The design seeks to maximize the amount of water captured from rainfall events while removing a significant portion of extraneous matter.

Operations continued

- Open the drain valve after each rainfall event to flush the system. This prepares the system for the next event and allows for the inspection of the quality of water in the lower section of the system.
- Inspect the filter after each major rainfall and back flush or replace filter if necessary
- When opening the drain valve, remove the upper cap to allow air in and make it easier to get the valve opened.