

## RAINWATER RECYCLING SYSTEM

Joe Ku  
Technical Advisor  
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### 1. Introduction

Water is a precious resource. It is a vital element to support human life as well as the development of a community. Besides the potable consumption of water such as drinking, other non-potable usage such as flushing of toilets, irrigation, plant watering, general cleansing etc. would also take up a considerable amount of water in the daily life. In areas where resources of water are limited, the non-potable water consumption would further threaten the living of human beings.

As non-potable water supply is not intended for intake by human beings, recycled water with proper treatment would therefore serve such purpose. Rainwater, being the largest resources of water supply, had therefore been utilized in recent years to augment clean, fresh water supply in some areas of the world.

### 2. Rainwater Recycling System

The rainwater recycling system basically comprises of four components, namely, the collection system, storage tanks, water treatment and the distribution system

#### 2.1 Collection

The collection system shall comprise of surface channels, roof drain outlets and the associated rainwater downpipes and a first flush device.

Surface channels, roof drain outlets and downpipes are those normal items which are used in the stormwater drainage system.

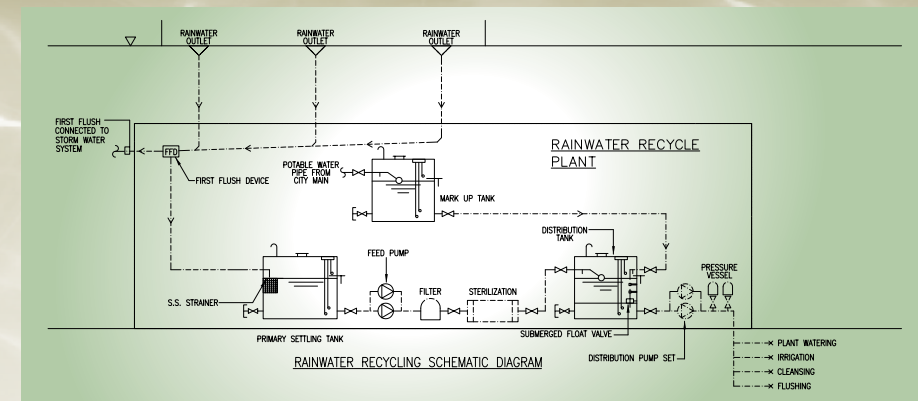
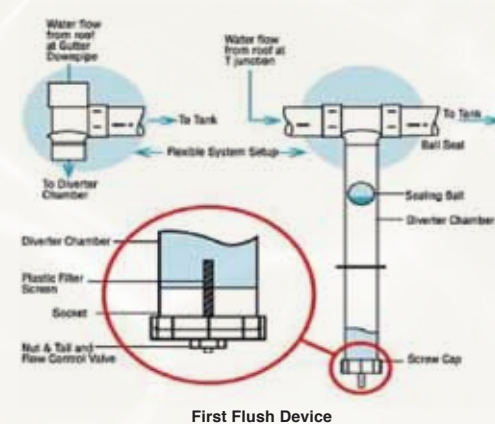
The first flush device is installed in the collection system prior to discharge to the storage tank. The first flush water would most likely be contaminated by debris, leaves, bird droppings, bacteria, heavy metals and other foreign materials on the roof surface. The elimination of the contaminated water would improve the quality of collected water and increase the efficiency of the downstream filtration/disinfection system by diverting this first flush of water to the stormwater system rather introducing it into the collection system. Depending on the design and the piping arrangement, the first flush devices could be accomplished with a manufactured device or a diverter pipe of sufficient liquid holding capacity or with some type of constructed basin with overflows.

As a general consideration, the first flush device shall have the following characteristic:-

- The flush off capacity shall be 35 litre of water per 100 m<sup>2</sup> of roof/catchment area for a moderately polluted area.
- If rainwater is collected from an area with lots of dust or other pollution sources, a larger first flush device shall be considered.
- First flush devices must be sited to facilitate easy maintenance.

#### 2.2 Storage

Storage tanks come in many shapes, sizes, and materials. They can be located below grade, above grade, near the roof, or in many other locations.



The appropriate tank size shall depend on:

- The catchment area
- The anticipated rainfall intensity, and
- The intended use of the collected water.

There could be some benefits to size the storage tank so that they overflow regularly to provide skimming of the water surface, but yet large enough to provide a reliable water supply.

Sufficient overflow connection from the storage tank to the stormwater system shall be provided to discharge excessive collection in case of emergency.

#### 2.3 Filtration and Disinfection

Depending on the requirement and the intended usage of the collected water, various treatments are required prior to this is being re-used.

Generally, the following treatments are suggested in order to provide an acceptable water quality for non-potable usage:-

1. Screening that consists of screen / mesh of durable materials such as stainless steel to intercept large particles such as leaves in the rainwater system
2. Primary settling which consists of settling tanks of adequate volume to allow settlement of fine particles in the rainwater. The volume of the settling tank shall be sized such that sufficient time shall be allowed for settling.
3. Filtering shall be carried out by means of medium rate sand filters to further purify the rainwater and screen off the remaining minute particles that have not taken care by the screening and primary settling process.
4. Disinfection to ensure that the treated rainwater is pathogen or germs free would be done after the above filtering. Various methods of disinfection are available. For non-potable usage such as cleansing, flushing, common methods of disinfection include dosage of chlorite solution, chlorine tablets into the treated rainwater could be considered.

#### 2.4 Distribution

The treated rainwater after disinfection shall be led to storage tank for distribution. Duplicate set of pump unit shall be provided to distribute the treated rainwater to the designated usage points.

In addition to the treated rainwater, supplement supply from the Government supply shall be provided to secure the usage. A properly designed mechanism shall be provided to avoid cross contamination between the two water sources.

Identification of treated rainwater pipework also requires some consideration. A dedicated colour band or painting is suggested in order to easily differentiate the treated rainwater system and the potable system.