



Manohar Patil

Why harvest rainwater

- To arrest ground water**
 - To beneficiate water quality in aquifers**
 - To conserve surface water runoff**
 - To reduce soil erosion**
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What is Rainwater Harvesting

- Collection**
 - Storage**
 - Recharge**
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How to harvest rainwater

Broadly there are two ways of harvesting rainwater

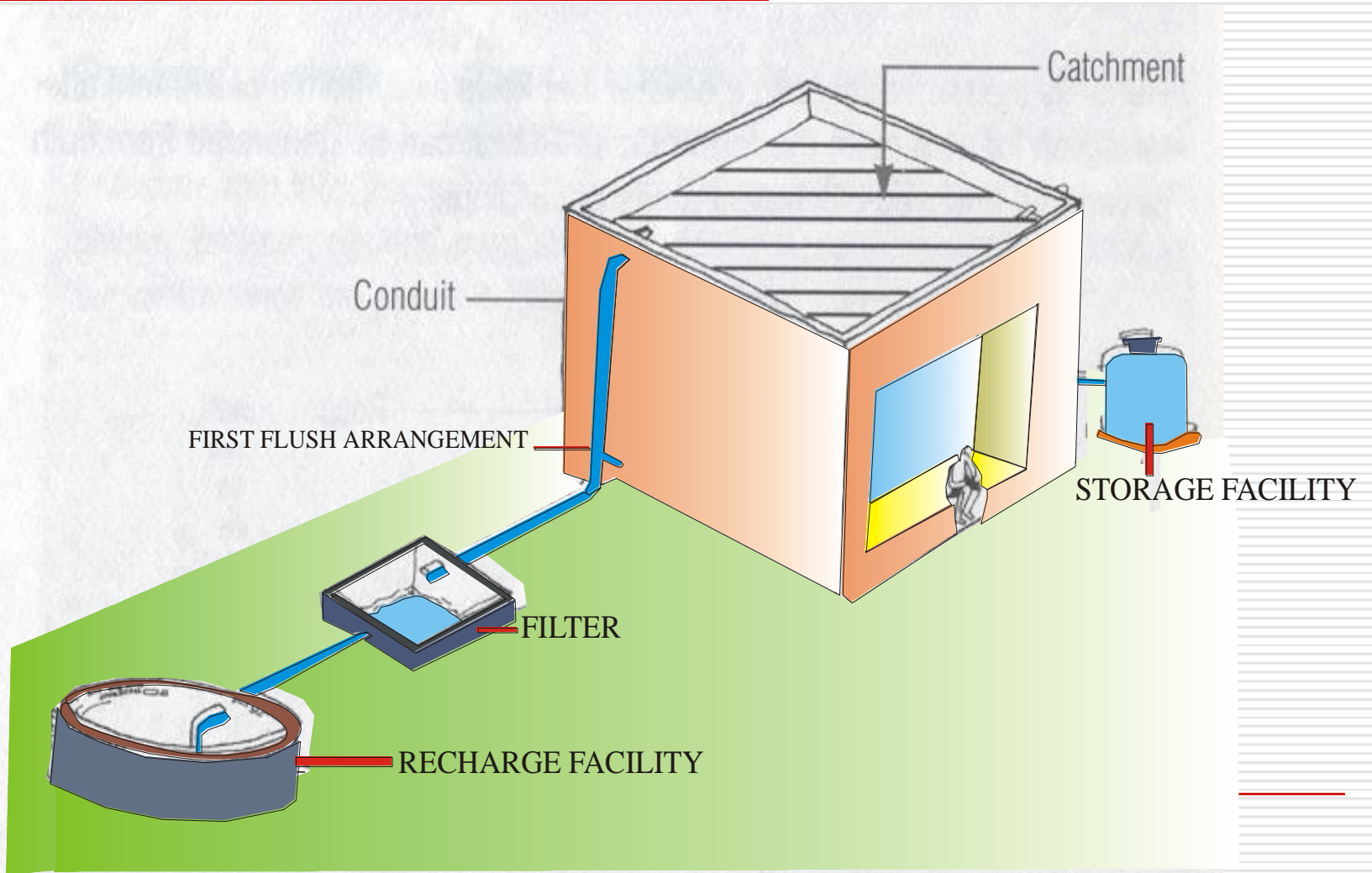
- **Surface runoff harvesting**
 - **Roof top rainwater harvesting (RTRWH)**
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Components of RTRWH system

The system mainly constitutes of following sub components:

- Catchment
 - Transportation
 - First flush
 - Filter
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Schematic diagram of a of typical roof top rainwater harvesting system



Commonly used Terms

Catchment

- ❑ The surface that receives rainfall directly is the catchment. Sloping roof or flat roof.

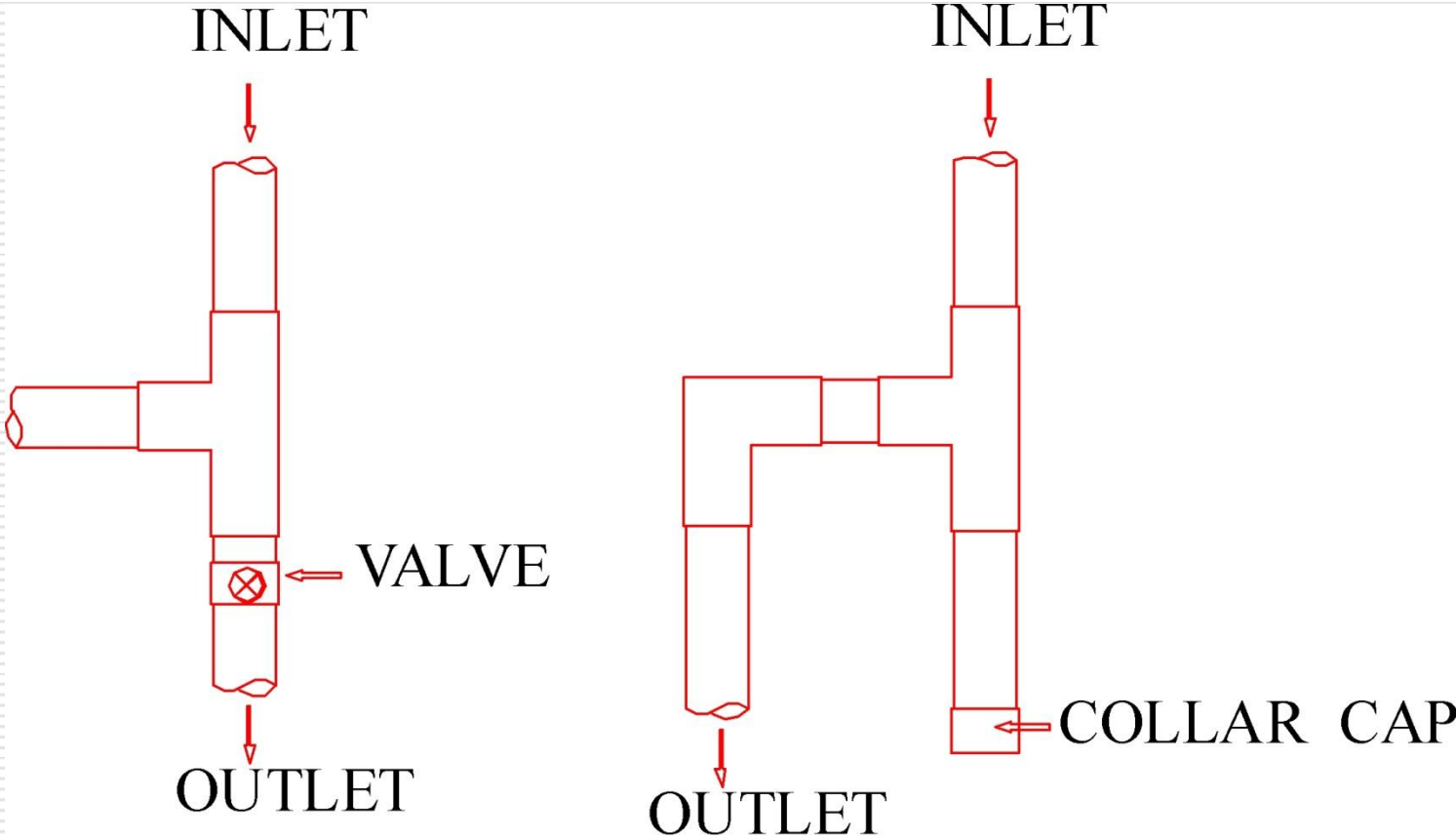
Transportation

- ❑ Rainwater from rooftop should be carried through down take water pipes or drains to storage/harvesting system. Water pipes should be UV resistant (ISI HDPE/ PVC pipes) of required capacity.

First Flush

- ❑ First flush is a device used to flush off the water received in first shower. Provisions of first rain separator should be made at outlet of each drainpipe.
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First Flush

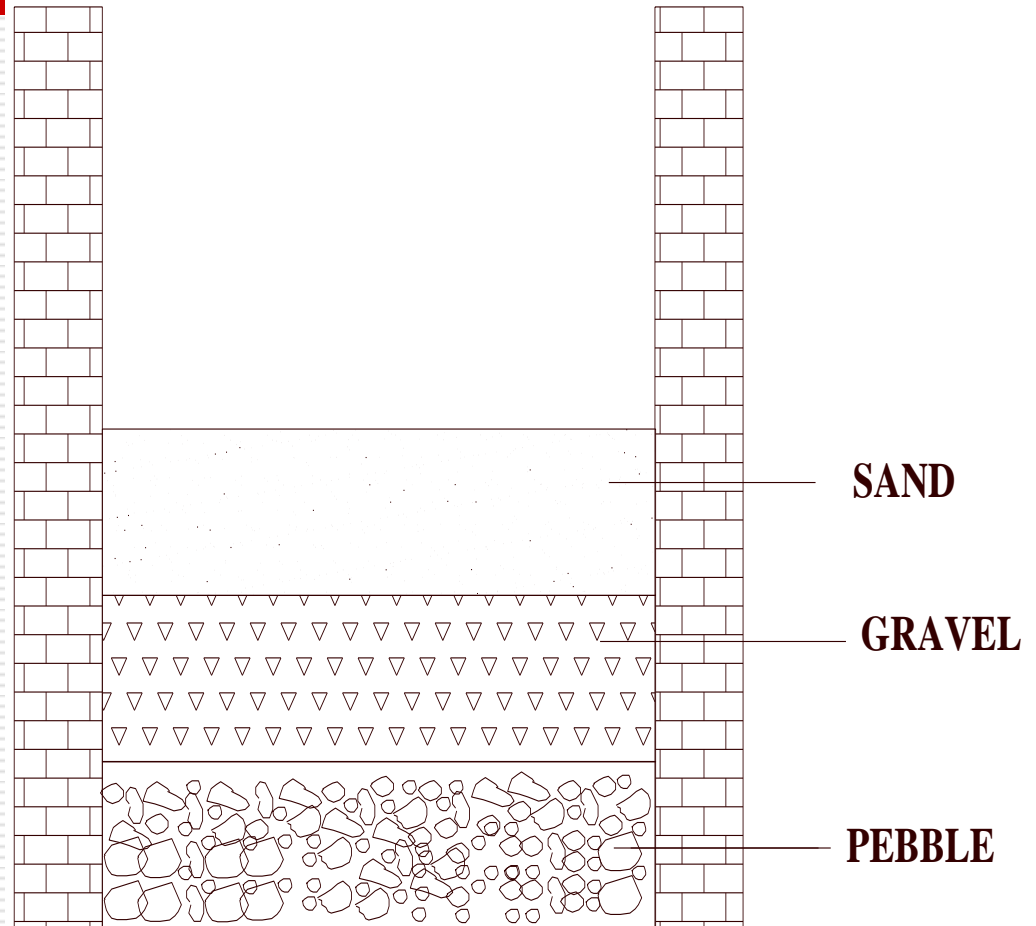


Filteration

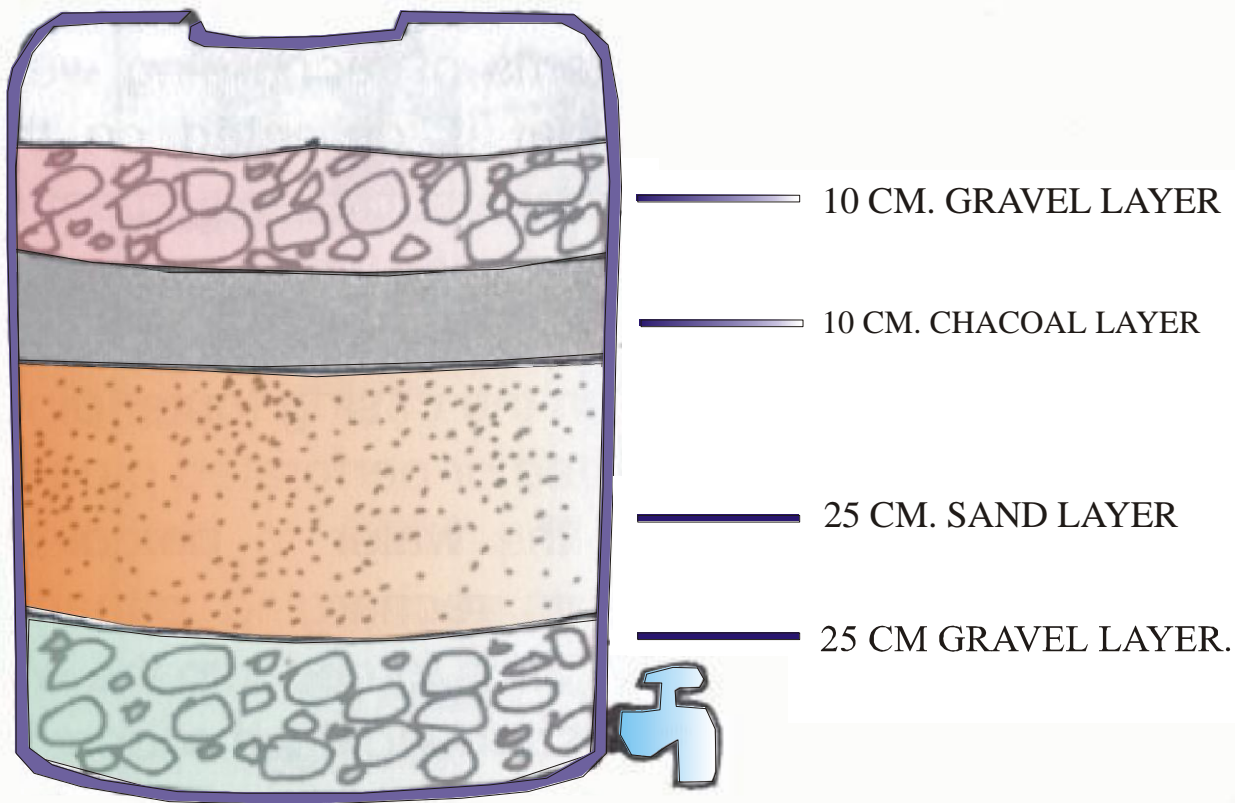
- Sand gravel filter**
 - Charcoal filter**
 - PVC – Pipe filter**
 - Sponge filter**
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Sand gravel filter

- These are commonly used filters, constructed by brick masonry and filled by pebbles, gravels, and sand as shown in the figure. Each layer should be separated by wire mesh.

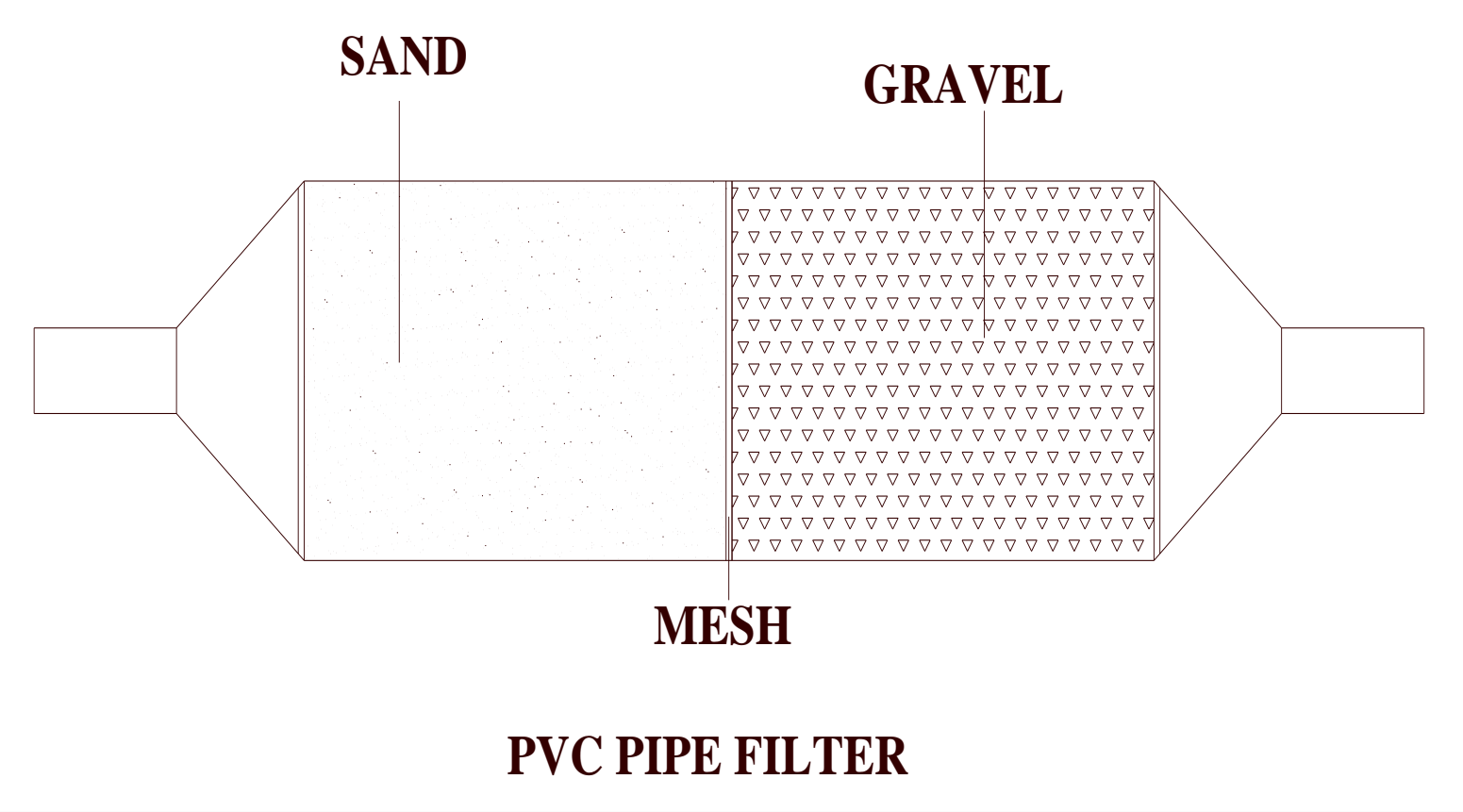


Charcoal filter



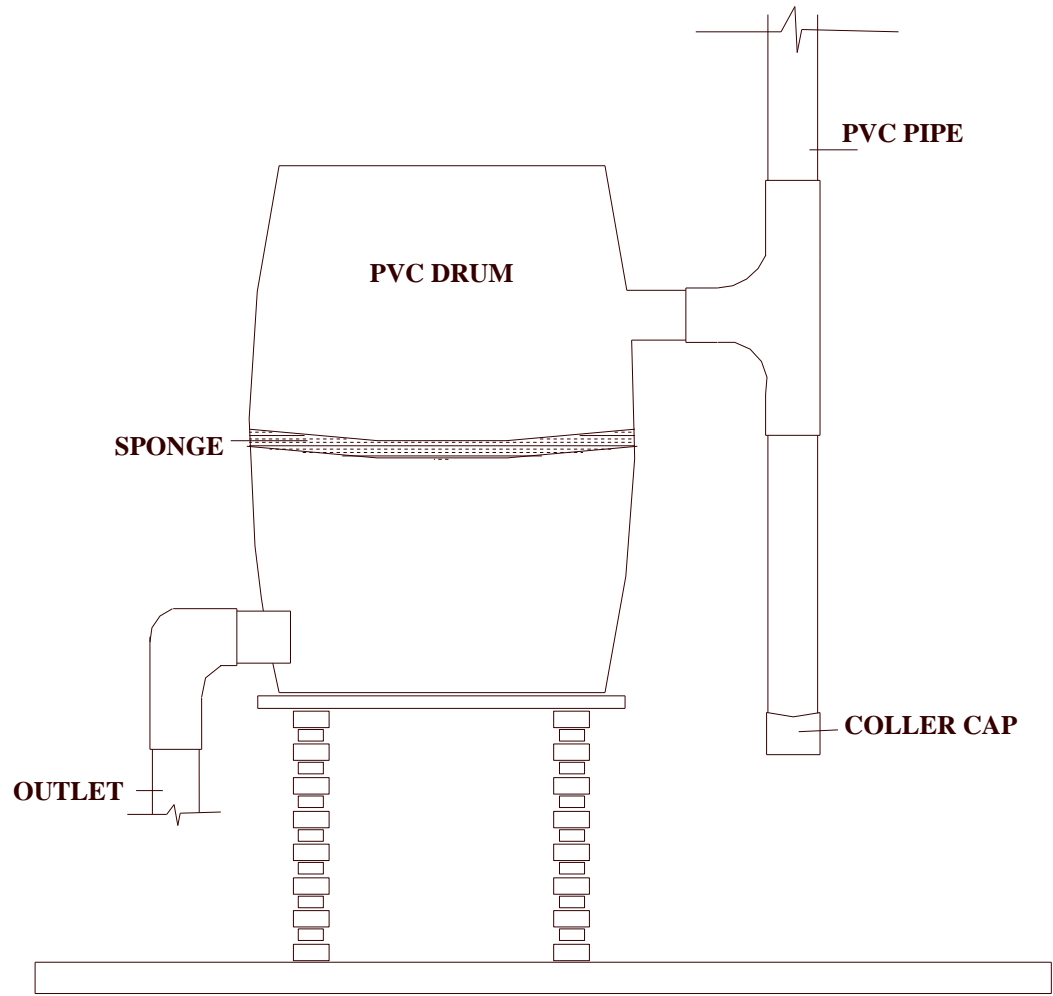
Charcoal filter can be made in-situ or in a drum. The drum or chamber should be filled by pebbles, gravels, sand and charcoal as shown in the figure. Each layer should be separated by wire mesh.

PVC – Pipe filter



Sponge filter

- It is a simple filter made from PVC drum having a layer of sponge in the middle of drum. It is an easiest & cheapest form of filter, suitable for residential units.



Methods of Rooftop Water harvesting

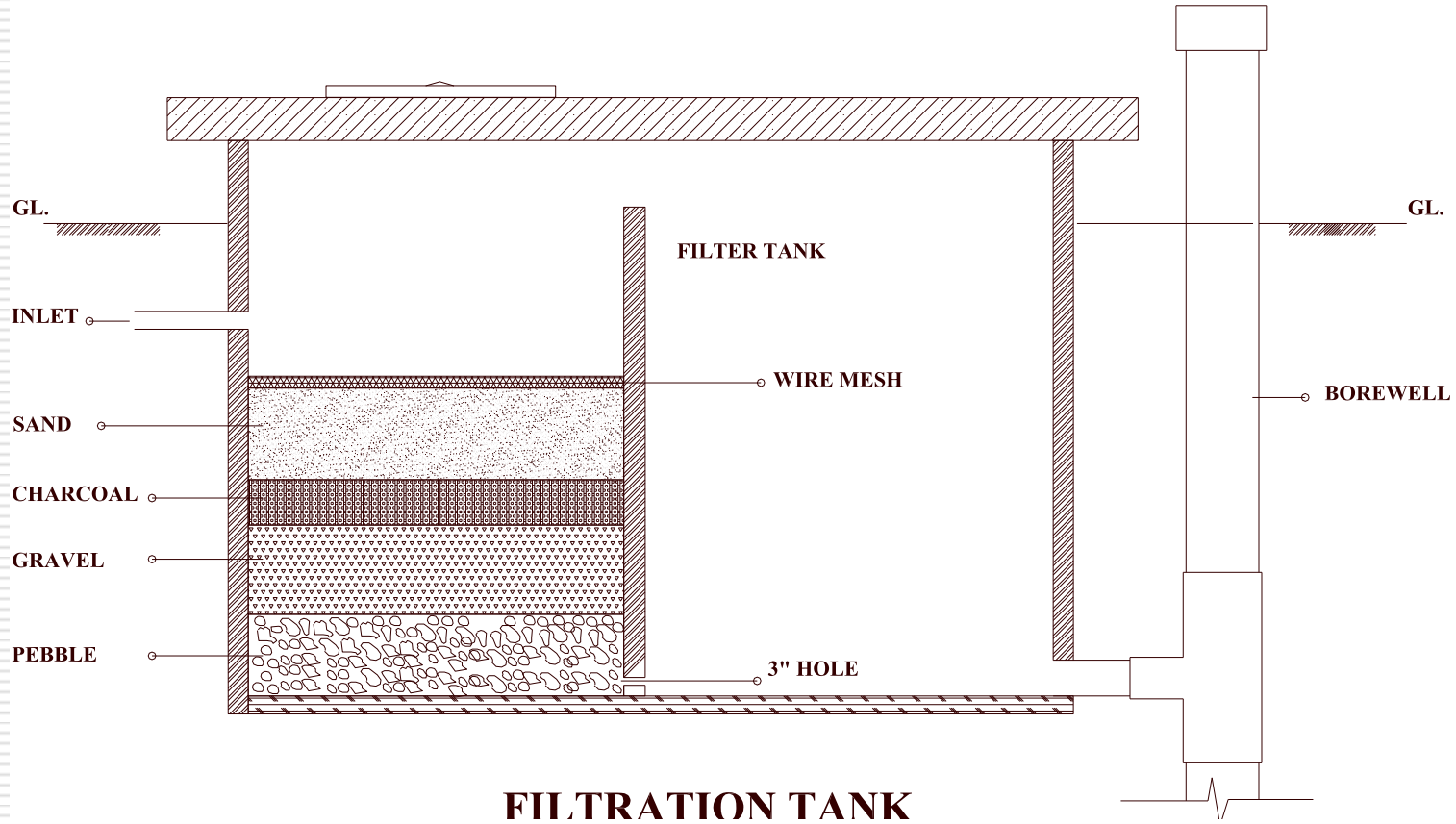
Storage for Direct use

- rain water collected from the roof is diverted to storage tank.
 - storage tank has to be designed according to the water requirements, rainfall and catchment availability.
 - Each drainpipe should have mesh filter at mouth and first flush device before connecting to storage tank.
 - Each tank should have excess water over flow system. Excess water could be diverted to recharge system.
 - Water from storage tank can be used for domestic and gardening purpose. It is most cost effective way of rainwater harvesting.
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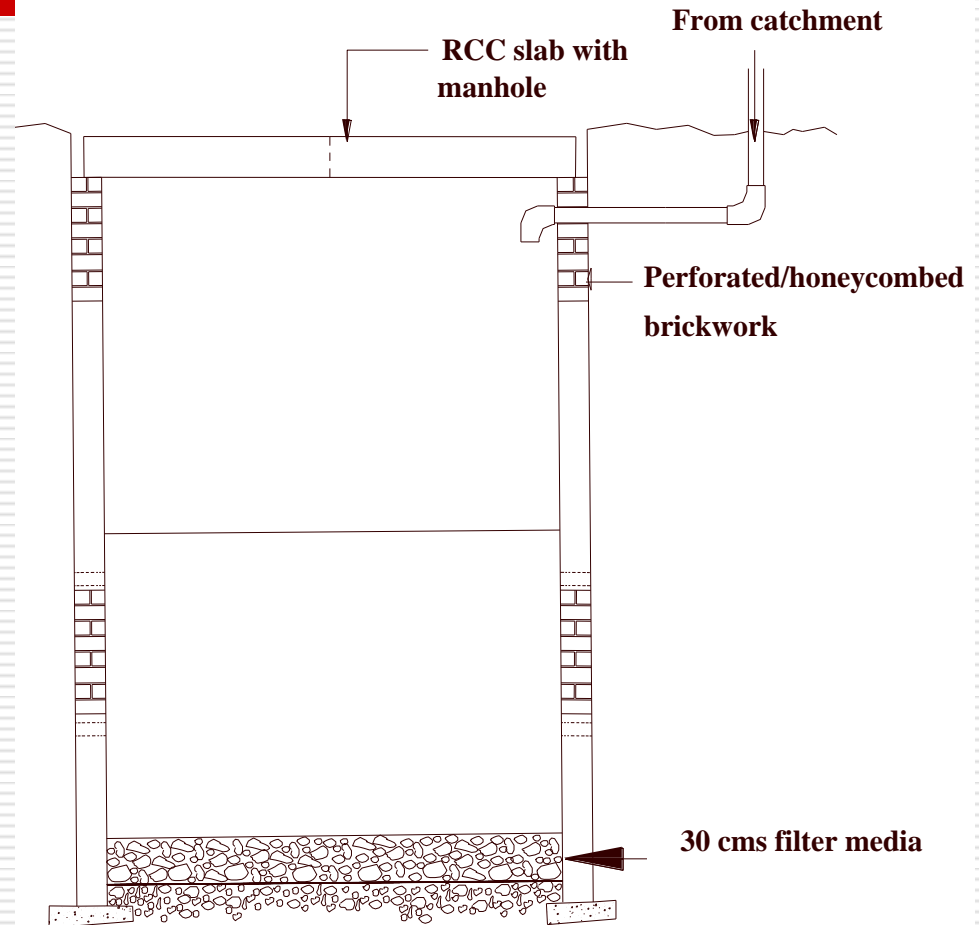
Recharging ground water aquifers

- **Ground water aquifers can be recharged by various kinds of structures to ensure percolation of rainwater in the ground instead of draining away from the surface. Commonly used recharging methods are: -**
 - 1) **Recharging bore wells**
 - 2) **Recharge pits**
 - 3) **Soakaways or Recharge Shafts**
 - 4) **Recharging dug well**
 - 5) **Recharge Trench**
 - 6) **Percolation Tank**
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Recharging bore wells

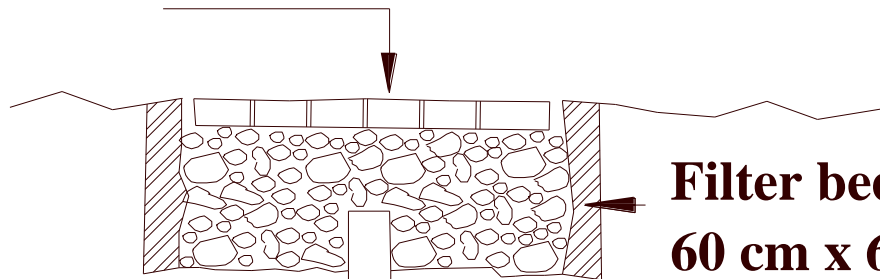


Recharge pits



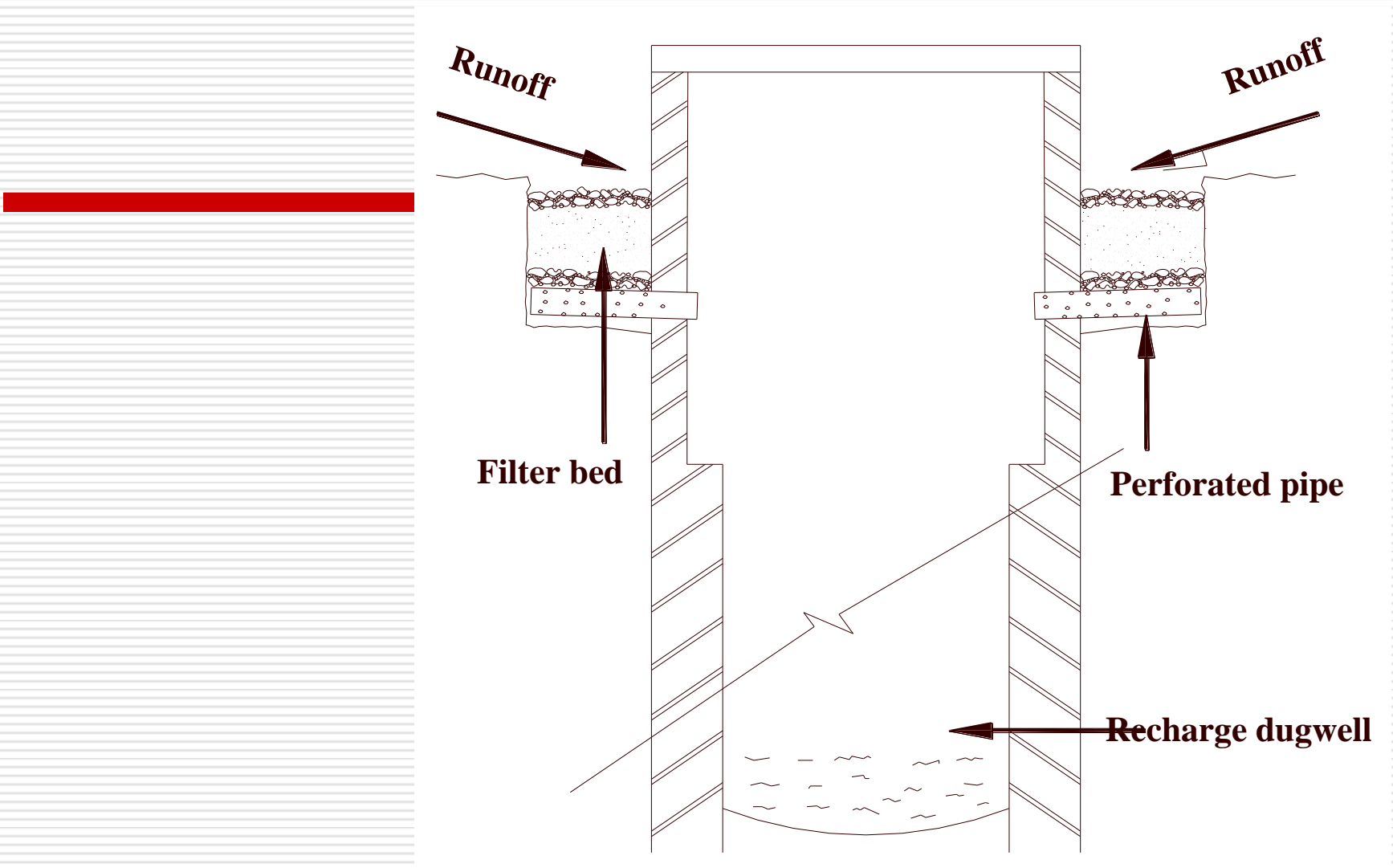
Soak-aways or Recharge Shafts

Perforated cover



Filter bed sump
60 cm x 60 cm. x 60 cm

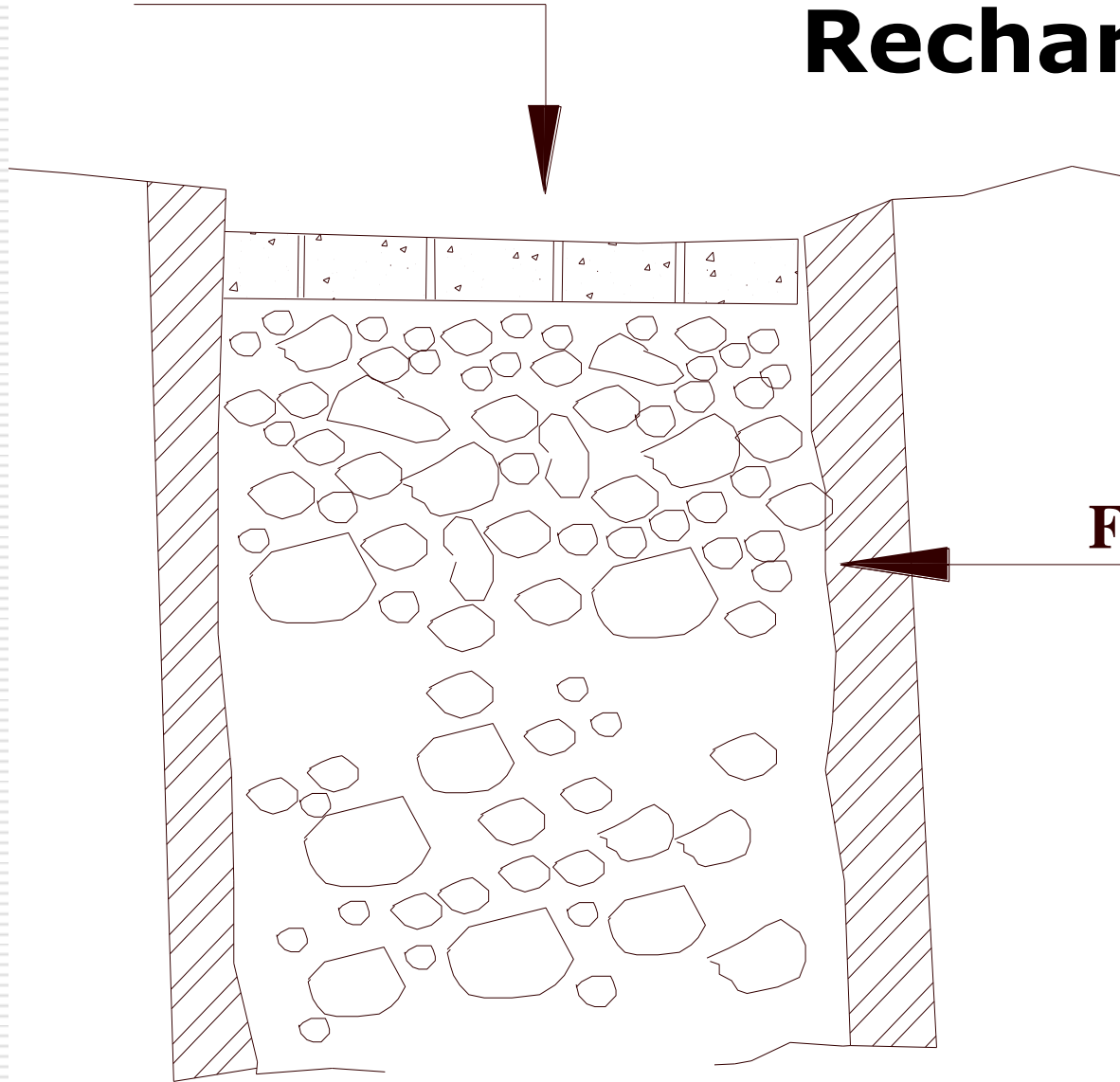
Perforated pipe



Recharging dug well

Perforated cover

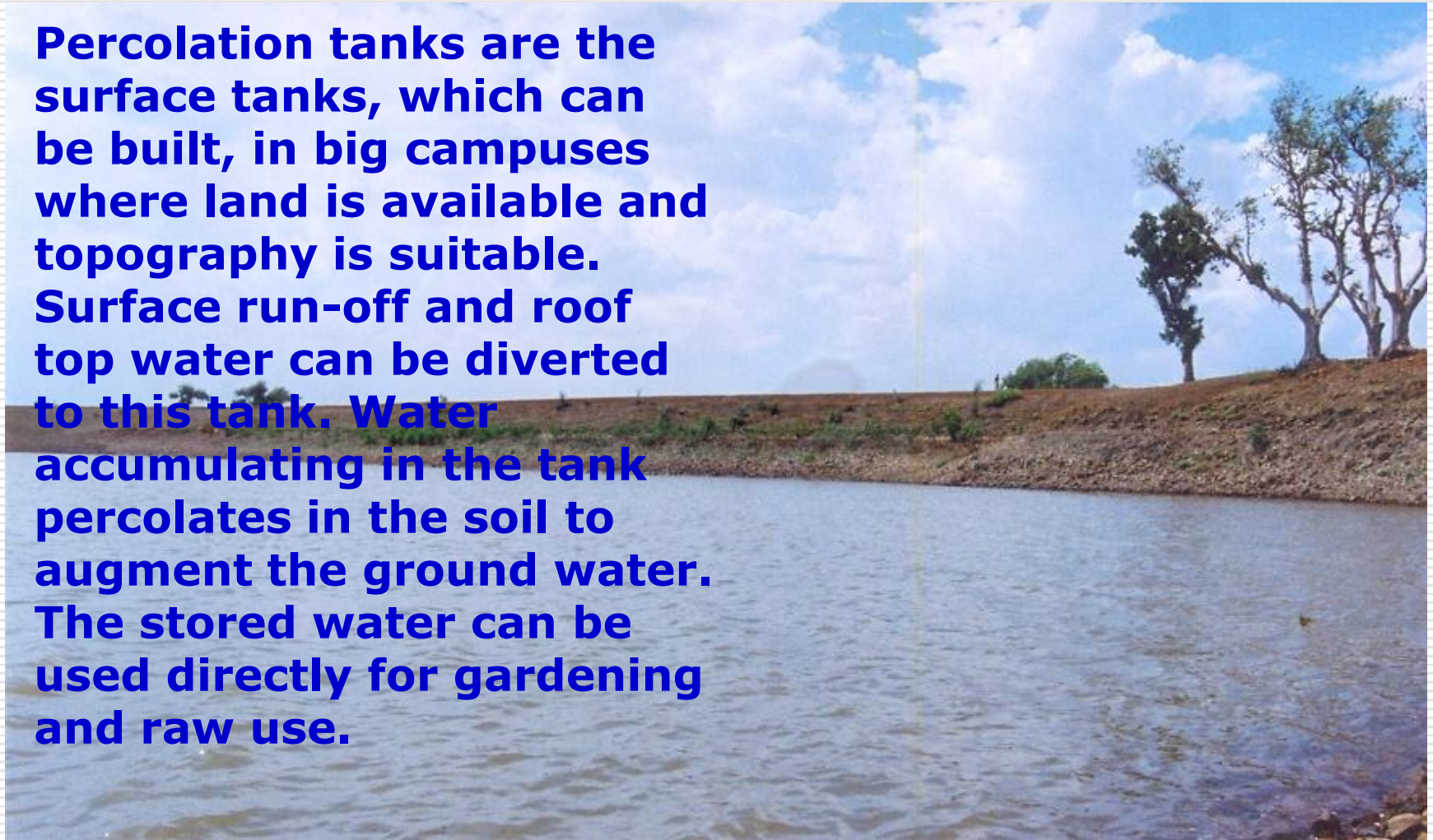
Recharge trench



Filter media

Percolation tanks

Percolation tanks are the surface tanks, which can be built, in big campuses where land is available and topography is suitable. Surface run-off and roof top water can be diverted to this tank. Water accumulating in the tank percolates in the soil to augment the ground water. The stored water can be used directly for gardening and raw use.



Design parameters

To calculate maximum amount of rainfall that can be harvested from the rooftop, following details are required: -

Area of roof - (A)
Average annual rainfall - (R)
Runoff coefficient - (C)

Quantity of maximum annual
rainwater harvesting = $A \times R \times C$.

Settlement tank

The capacity of the settlement tank should be enough to retain the runoff of peak rainfall intensity period. Following data are required to calculate capacity –

Area of roof top - A

Peak rainfall in 15 min. - Pr

Runoff coefficient - C

Capacity === $A \times Pr \times C.$

Recharge tank/ filtration chamber/ recharge trench

Water holding capacity of recharge tank/ filtration chamber/ recharge trench is less than its gross volume because it is filled with porous material.

factor for void ratio has to be applied in the calculation

Following data required for the capacity: -

Area of roof top - A

Peak rainfall in 15 min - Pr

Runoff coefficient - C

Void ratio - D

Required capacity $Q = A \times Pr \times C \times D$

Length of recharge trench = $Q / b \times d$

(Where b is width and d is depth of trench)

Precautions

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- ❑ The roof or terraces used for harvesting should be clean
 - ❑ Do not store chemicals, rusting iron, manure or detergent on the roof
 - ❑ Avoid using terraces for toilet by you and your pets
 - ❑ Provide gratings at mouth of each drainpipe on terraces to trap debris and floating materials
 - ❑ Prevent storage system from contamination
 - ❑ Provision of first rain separator should be made to flush first rain
 - ❑ Do not use polluted water to recharge ground water
 - ❑ Before recharging arrangements of filtering should be provided
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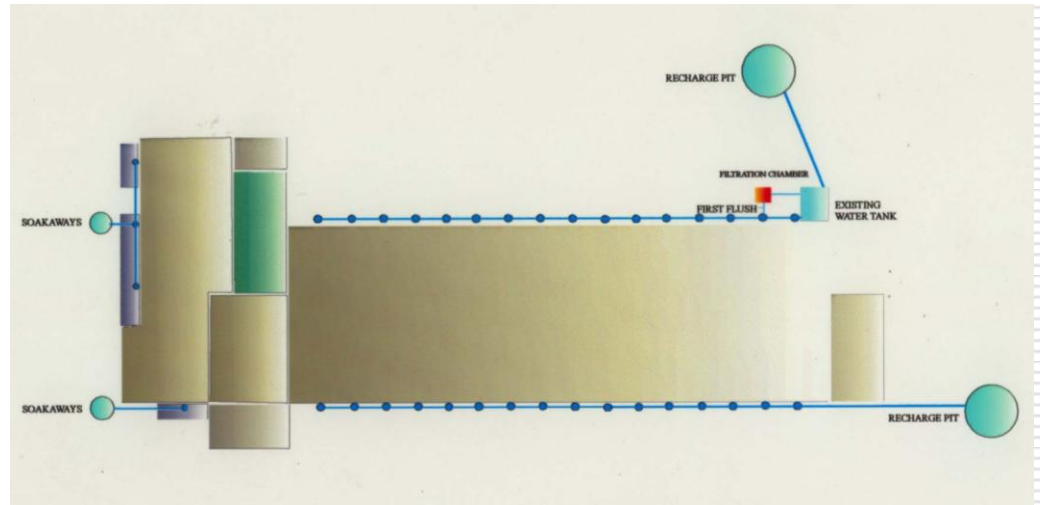


1. ROOF AREA	- 560.0 SQ.M
2. TYPE OF ROOF	- RCC FLAT
3. AVERAGE RAINFALL	- 1000MM.
4. RAINWATER AVAILABLE	- 560.0CUM
5. TOTAL HARVESTABLE RAINWATER	- 390.0CUM/Y
6. APPROXIMATE COST	- RS. 50,000

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PROPOSALS FOR RTRWH:

- A) STORAGE FOR DIRECT USE
- B) RECHARGE PITS
- C) SOAKAWAYS





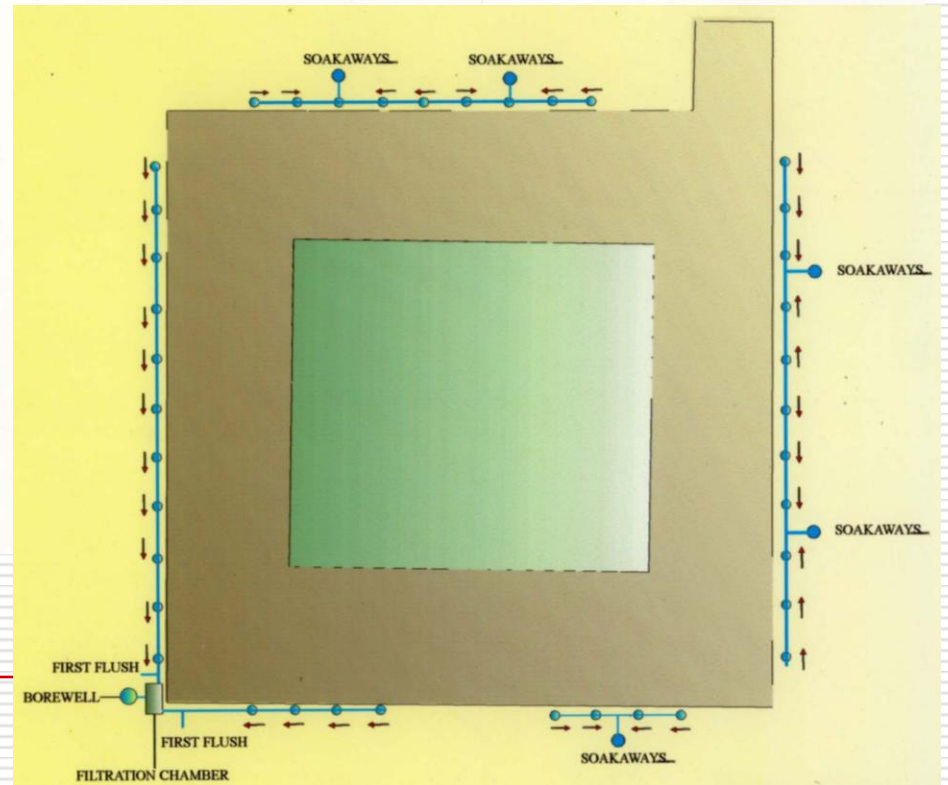
- | | |
|--------------------------------|----------------|
| 1. ROOF AREA | - 1841.40 SQM |
| 2. TYPE OF ROOF | - FLAT |
| 3. AVERAGE RAINFALL | -1000MM. |
| 4. RAINWATER AVAILABLE | -1841.40 CUM |
| 5. TOTAL HARVESTABLE RAINWATER | -1288.98 CUM |
| 6. APPROXIMATE COST | -RS. 70,000.00 |

MAHARAJWADA, MAHAKAL AREA, UJJAIN

PROPOSAL FOR RTRWH

A) RECHARGING BOREWELL

B) SOAKAWAYS



**Catch the water
where it falls**

Thanks

