

A ROLE OF WATER HARVESTING IN RURAL AND URBAN AREA

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Abstract:- The rapid development of cities and consequent population explosion in urban areas has led to depletion of surface water resources. For fulfillment of daily water requirement, indiscriminate pumping of ground water is being resorted to, leading to lowering of ground water table. At the same time the rain water is not being conserved which ultimately goes waste. To avoid this imbalance, conservation of rain water in the form of rain water harvesting is the only solution.

Rain water harvesting can be effectively implemented in our office and residential complexes for conservation of rain water. The subject has assumed lot of significance in the present scenario. This has been included in Indian Railway Works Manual 2000 vide correction slip no. 10 dated 17.02.05 also. This publication is an attempt to compile all the relevant information regarding various methods commonly in use. These methods can be used by field engineers for designing and implementing Rain Water Harvesting systems.

Keywords:- Rain water, Ground Water, Harvesting, Methods.

INTRODUCTION

It is type of Water harvesting. It can be defined as the system of collection of rain water and its runoff and its productive use for:-

- Irrigation of annual crops pastures and trees.
- Domestic and livestock consumption.

Water is the most common or major substance on earth, covering more than 70% of the planet's surface. All living things consist mostly of water.

For example, the human body is about two third water. Worldwide distribution of water of the total volume of water, only 2 percent (over 28,000,000 Km³) is fresh water, which can be used for consumption. The average runoff in the river system of India has been assessed as 1869 km³. Of this, the utilizable portion by conventional storage and diversion is estimated as about 690 km³. In addition, there is substantial replenishable ground water potential in the country estimated at 432 km³. The per capita availability of water at the national level has reduced from about 5,177 m³ in the year 1951 to the present level of 1,869 m³. For improving per capita water availability in the country, replenishment of ground water resources is a necessity which can be done very effectively through rain water harvesting.

LITERATURE REVIEW

The various method of rain water harvesting explained in previous chapters are equally applicable for the single building or structure which is having builtup area. Since the principals of rain water harvesting are universal, the same can be applied for rain water harvesting in big colonies/establishment with some minor modifications. The basic components of any rain water harvesting system remain the same but the number and size may very depending upon the catchments area.

If the rain water harvesting has to be implemented in a large area i.e. an office complex or big residential complex, the area can be subdivided into smaller parts. The runoff from each smaller part can be harvested through recharge structures constructed nearby while the runoff from open areas can be channelized through storm water drains into recharge structures.

1162.5 sqm and open area in the hostel is approx. 900 sqm. In first phase, the rain water harvesting has been implemented in left wing of the hostel, covering a roof top area of 465 sqm and open area of 788 sqm. For rain water harvesting, a deep bore well of 32m. Depth and 150mm dia. has been bored.

DISCUSSION

Need for Rain water harvesting: -

- Major part of our country have been facing continuous failure of monsoon and consequent deficit of rainfall over the last few years.
- Also due to ever increasing population of India, the use of ground water has increased drastically leading to constant depletion of ground water level causing the wells to dry up.
- In some places, excessive heat waves during summer creates a situations similar to drought.
- It is imperative to take adequate measures to meet the drinking water needs of the people in the country besides irrigation and domestic needs.

Goals of Rain Water Harvesting:-

- Recharge ground water :-
- Improve living conditions :-
- Substitute ground water :-
- Reduce flood risk :-
- Reduce soil erosion risk :-

HARVESTING OF RAIN WATER

Rain water can be harvested in a variety of following ways:-

- Directly from roof tops and stored in tanks :-
- Monsoon run off and water in swollen it in underground tanks :-
- Water from flooded rivers can be stored in small ponds :-
- Collection and transfer of rainwater into
- Percolation tanks so as to facilitate discharge into ground.
- streams during the monsoon and storing

Components of Rain Water Harvesting:-

1. CATCHMENT
2. DILIVERY
3. STORAGE

MODELS OF RAIN WATER HARVESTING

There are two main models of Rain Water Harvesting done in India: -

1. RURAL MODEL (Includes Traditional Models) :-

2. URBAN MODEL (Includes modern Methods) :-

1. RURAL MODELS :-

- Rural Areas generally use traditional methods of rainwater harvestings.

- Main motive of rain water harvesting in these areas is to facilitate irrigation for agriculture and use of water for domestic and drinking purposes
- Now a days practices are also been followed to as to recharge ground water levels
- Many of the traditional structures include Tank, Kunds, Khadins etc.

METHODS OF HARVESTING RAIN WATER

Rain water harvesting methods There are three methods of harvesting rain water as given below: -

- Storing rain water for direct use
- Recharging ground water aquifers, from roof top run off
- Recharging ground water aquifers with runoff from ground area

Traditional Methods: -

TANKAS

Tankas (small tanks) are underground tanks, found traditional in most Bikaner houses. They are built in the main houses or in the courtyard. They were circular holes made in the ground, lined with fine polished lime in which rainwater was collected. In this way, the people of Bikaner were able to meet their water requirements.

GULS OR KULS

In hilly areas and in western Himalayas, people have constructed diversion channels called "Guls" or "Kuls"

3. URBAN MODEL :-

- **More modernized system of rainwater harvesting.**
- **The main components of the urban model are :-**
 - a) Roof catchment
 - b) Gutters
 - c) Down pipe
 - d) First flush pipe
 - e) Filter unit
 - f) Storage tank
 - g) Collection pit

Components of Urban Model:-

Storage Tanks

Pipe System

GRAVEL LAYER

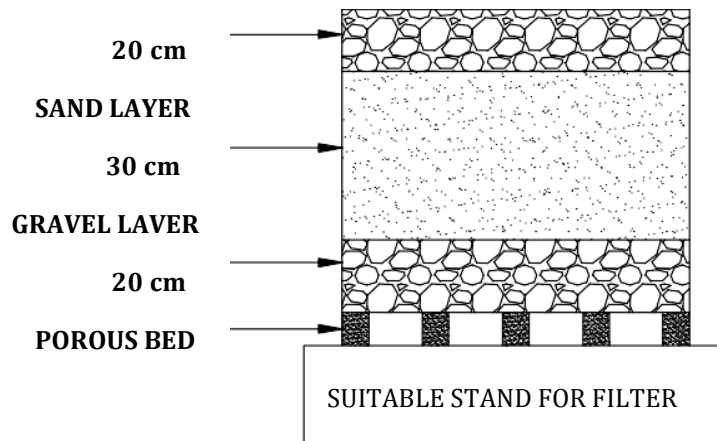


Fig 1: Sand Filter

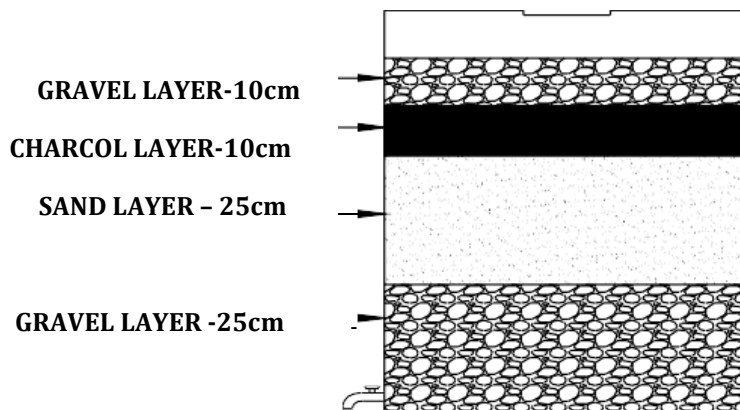


Fig 2 : Charcol Filter

Table 1: Showing Rainfall & Discharge

Sl. No	Month	Rainfall (mm)	Discharge (m ³)
1	January	15.1	39.396
2	February	24.9	64.96
3	March	16	41.74
4	April	16	41.74
5	May	40.6	105.9
6	June	237.4	619.38
7	July	386.4	1008.12
8	August	393.9	1027.69
9	September	211.5	551.8
10	October	67.7	169.63
11	November	8.7	22.7
12	December	7.2	10.96
	TOTAL	1422.40	3694

TABLE2: Size of downspout pipe

Diameter Of pipe (in mm)	Average rate of rain fall (in mm/hr)					
	50	75	100	125	150	200
50	13.4	8.9	6.6	5.3	4.4	3.3
65	24.1	16.0	12.0	9.6	8.0	6.0
75	40.8	27.0	20.4	16.3	13.6	10.2
100	85.4	57.0	42.7	34.2	28.5	21.3

Fig.3: Showing Volume of water Collected from Rainfall throughout the year

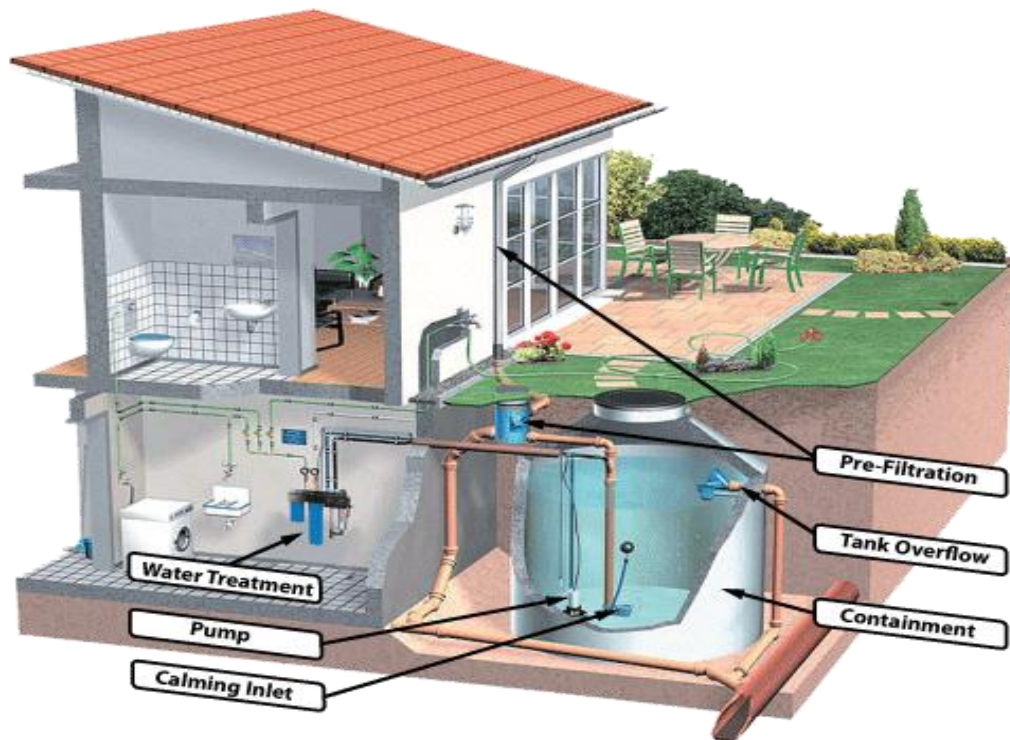
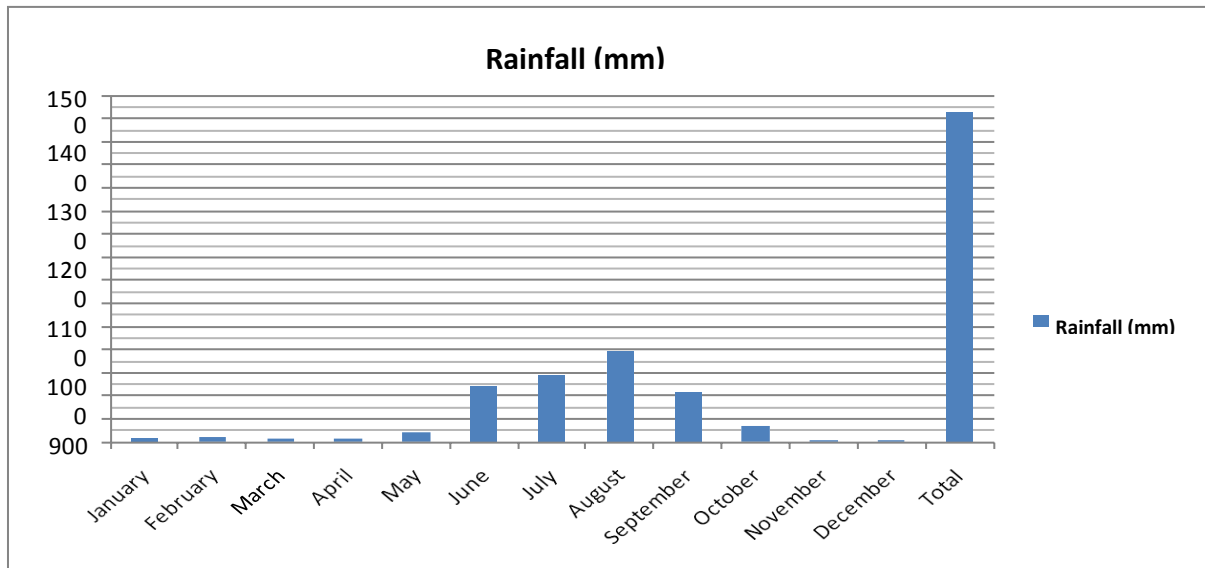


Fig 4: Rain Water Harvesting

ADVANTAGES

- Rainwater Harvesting provides a good supplement to other water sources thus relieving pressure on other water sources.
- It can supply as a buffer and can be used in times of emergency or breakdown of public water supply systems.
- Helps reduce the storm drainage load and flooding in the cities.
- It is a flexible technology and can be build to require meets of any range.
- Prevents water wastage by arresting run off as well as prevents soil erosion and mitigates flood.

DISADVANTAGES

- In terms of complex constructions, there are requirements for high costs, trained professionals.
- Maintenance cost may add to the monetary burden.
- If not maintained properly then it can cause various problems in terms of algal or bacterial growth.
- Tanks if not constructed properly might result in leakage and metal tanks may also lead to problems such as corrosion harming the water quality.

Result:

- While in the **Urban areas rainwater harvesting** is practiced for drinking, domestic, gardening and Ground **water recharge** purposes,
- **In Rural areas** it is undertaken more extensively for irrigation, dryland agriculture, horticulture
- Ground **water recharges** domestic, livestock, inland fisheries etc.

CONCLUSION

- Due to indiscriminate pumping of ground water, the water table has already gone down abnormally and if we do not wake up even now then our future generations may have to face severe crisis of water.
- The rains are important source of water and if we can harvest rain water,
- The scarcity of water can be eliminated altogether. Therefore, we, the human beings, are largely dependent on water for our survival.
- Although water is as important for survival of human beings as much as food, air etc. but we hardly pay any attention for its economical use and conservation of this precious resource.

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