Rooftop Rainwater Harvesting System For Individual Household

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Abstract- *As the world population increased the demand increases for quality drinking water .But most of the area have been paved and the chance of percolation of water is completely reduced .for using the method of rainwater harvesting we will re-utilize the rain water for domestic and agricultural purposes. The rain water harvesting not only helps in meeting the daily water use but also helps in increasing the ground water consumption*

Keywords- Roof Top , House Hold, Catchment Area.

I. INTRODUCTION

Rain water harvesting has been in use from ancient times. We need water for all our daily activities. Water supply in urban areas is always shortage against the total demand. Due to rapid urbanization infiltration of rain water in to the sub soil has decreased drastically and recharging of ground water has diminished .Rain water harvesting is the process of collecting and storing rainwater in a scientific and control manner for later productive use .One of the biggest challenges of 20th century is to overcome the growing water shortage. According to Kim et al (2005),rainwater harvesting may be one of the best method available to recovering the natural hydro logic cycle and enabling urban development become sustainable. The harvesting of rain water has the potential to assist in alleviating pressures on current water supplies and storm water drainage system .rain water collection has the potential to impact many people in the world.

II. OBJECTIVE

- To Deign A Suitable Roof Top Rainwater Harvesting System For The Individual House Hold.
- To Estimate The Rain Water Harvesting Potential Of The Catchment Area Of The Individual Household.

III. STUDY AREA

Study area is located in Lucknow district eastern reason of Uttar Pradesh .During monsoon in the months of June July august and September maximum rain fall precipitated .In these four months almost 850mm rainfall is precipitated and average annual rainfall is 999mm.The reasons for collecting the rainwater for the daily use of house hold. Hence specially during the summer season there is a huge draw down of the ground water resources, to overcome this problem, the collection of rainwater is done.

Fig.1: Catchment Area Of Rooftop

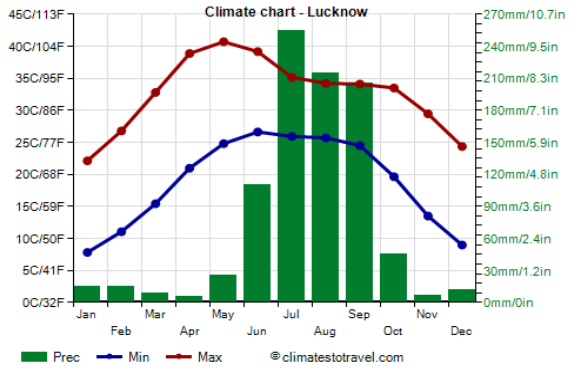


Fig. 2: Mean monthly rainfall variation pattern of Lucknow zone

IV. DESIGN STEPS OF ROOFTOP RAINWATER HARVESTING SYSTEM

There are six main steps to design the roof top rainwater harvesting system

1) Calculation of Catchment area
2) Estimation of rainfall potential
3) Determine the total amount of water required
4) Transportation system
5) First flushing and filer
6) Underground water tank

1: Calculation of Catchment area:

The surface or land that receives rainfall directly is the catchment area of rainwater harvesting system
Length of the roof = 22m
Breadth of the roof = 20m
Catchment area = 22m*20m =440m2

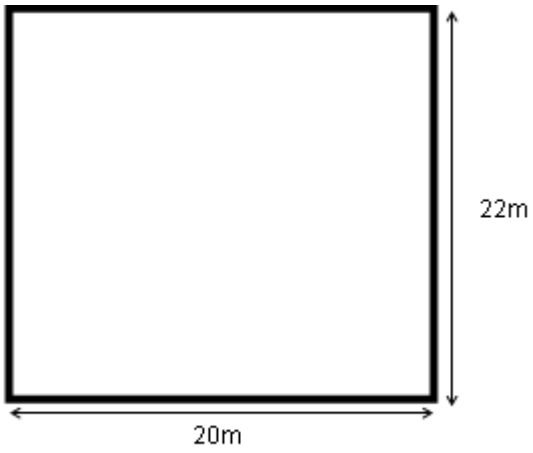


Fig.3: plan of roof slab

2: **Estimation Of Rainfall Potential:**

Height of annual rainfall = 0.999m
Catchment area = 440 m2
Water that can be harvested = catchment area*height of annual rainfall*runoff coefficient
= 440m2*0.999m*0.6
Water that can be harvested = 263.736m3
Including 5% water losses = 263.736*5/100
= 13.18m3
Total water has to be stored = 263.736 - 13.18
= 250.556 m3

3: Estimation Of Amount Of Water Required:

The standard norm for domestic water usage in India is 135 litre per person per day

Members in family = 5 person
Average daily use = 135 * 5 = 675 litre
Yearly usage = 675 litre * 365days
= 246375 litre
= 246.375 m3
According to above data it can be easily found that harvested water is sufficient to be used by one family for an year

4: Transportation System :

Rain water is transferred from catchment area to the storage tank by the help of conduits (pipes). We are using polyvinyl chloride (PVC) pipes and fittings. The number of pipes and fittings required for the transportation are taken as per the topographical condition and distance from catchment area to the storage tank.

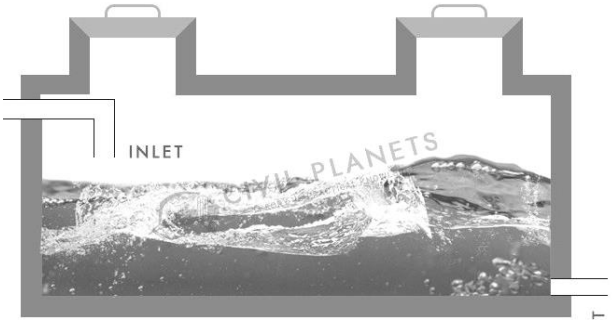
5: First Flushing And Filter:

First flush is a device used to flush of the water received in first spell of rain. This need to be done since the first spell of rain carries a large amount of pollutants and contaminate water from the air and catchment area.

Filters are used for treatment of water to effectively remove turbidity. After first flushing of rainfall, water should pass through filters. Filtered water is transfer to the storage tank for further uses.

6: **Underground Water Tank:**

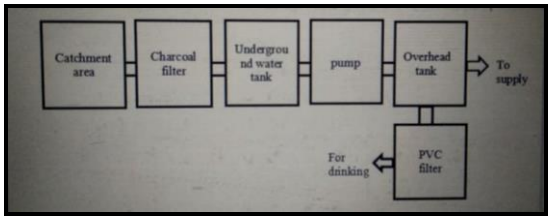
The underground water tank is constructed according to the calculation made by the amount of water in-take. The water tank is constructed using brick masonry work. After filtration, rain water is transferred to the underground water tank for further use.



Fig,4: underground water tank

V. PROJECT SET-UP

Complete set-up of rooftop rain water harvesting system



Fig, 5: block diagram of complete set-up of rooftop rainwater harvesting system

Rain water is directly collected on the roof top surface and water from catchment area is passed to the charcoal filer tank by the help of pipes.

After purification, purified water is transfer to the underground water tank from where it is supplied for domestic use. For drinking purpose water is passed to the PVC filter from overhead tank.

VI. CONCLUSION

This study was aimed at designing a rooftop rainwater harvesting system for the individual house. According to the above data we stored 250.556 m3 rainwater which is sufficient to be used by one family for year. By the help of RRH system we can also overcome the water scarcity problem of an area during non- monsoon season.

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