



STUDY OF RAINWATER HARVESTING SYSTEM IN CHHATTISGARH

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ABSTRACT

Water is an important natural resource for the survival on this earth. With the increase in population of india and its day to day utilization surface and ground water resources are being utilized in a faster way than they can be recharged. So with keeping all these things in mind we can use our resources in effective ways by implementing Rain water harvesting system. This project highlights the need ,concept and implementation of RWH systems that can be implemented on different villages and districts of chattisgarh based on previous years Rainfall and water availability records.

Keywords: Rainwater harvesting, design concept, groundwater recharge.

1. INTRODUCTION

Rainwater harvesting system is a method of collection of rainwater through roofs or open spaces in buildings or areas and recharge of ground water level so that this stored water can be use for various purposes. Due to the increase of population and infrastructure and land development projects results in demolition and deterioration of our natural environment. This imbalance our natural environment working patterns. And water shortage problem is an outcome of this activities.

Chhattisgarh is covered by these water systems of India : Ganga ,Mahanadi,Narmada and Godawari. This rivers drain the different districts of Chhattisgarh. The water shortage problem has been faced in different areas of Chhattisgarh like mantringa village ,balrampur is battling with water issue since 20 years, Rajnandgaon ,Raipur and other districts in previous years. Previous years records shows the rainfall amount fluctuations in these areas. Due to un awareness and improper knowledge of effective management of water , peoples are facing these problems .So RWH System is an effective way of water management.

Benefits of Rain water harvesting system:

- 1) Rainwater is a free source of water.
- 2) Rainwater can be used for plantation and gardens or others.
- 3) It can supplement groundwater and municipal supply connection.
- 4) Lowers the water supply cost.
- 5) Environmentally adequate and naturally capable ,use of basic innovations

Components:

- 1) Roof catchment
- 2) Catchment area
- 3) Gutter
- 4) Down pipe
- 5) Filter unit
- 6) Storage tank

Need for Rainwater Harvesting System:

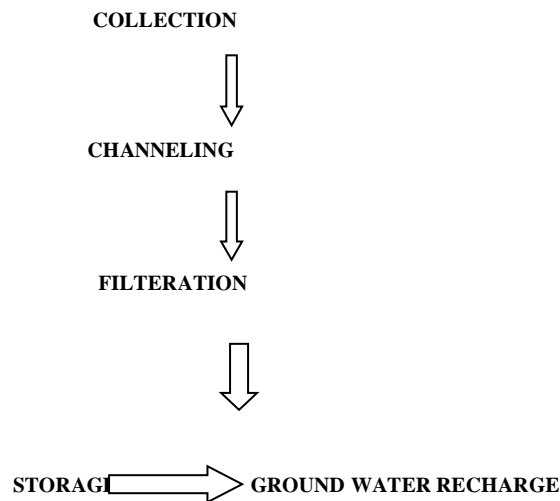
- 1) As the water shortage problem increasing day by day due to various reasons ,it is accomplish to adopt these system as individual to fulfil water needs.

- 2) Groundwater level is decreasing and gets infected and contaminated.
- 3) Health at risk because of using contaminated water.
- 4) To do effective plantation using these water.
- 5) Control soil disintegration due to excess surface runoff.

2. METHODOLOGY

Our study area is Chhattisgarh. We will plan rainwater harvesting system that can be implemented in all the residence located in various regions of Chhattisgarh. For better understanding of whole process we will take an example of a residence and will design a rainwater harvesting system for that including all design and detailed parameters. we will take a residential building and plan the space and placing of storage tank and paths of pipes from various catchment area to the tank and flow of water and dimension of tank and design

3. STEPS OF RWH



Study area:

The state of Chhattisgarh lies between north latitude 17°47" to 24°06" and east longitude 80°14" to 84°24". The area of this state is 1,37,360 sq.m. Geographically, it is divided into –

- Bastar plateau region
- The Chhattisgarh plane
- Northern hilly region

Rainfall is the major source of ground water recharge in the area and receives maximum (85%) rainfall during the southwest monsoon season. (10-15%) in the winter season.

We have taken the district-wise record of average annual rainfall (mm) of chhattisgarh. BY using this average rainfall data we can design the capacity and requirement of tank size and others details.

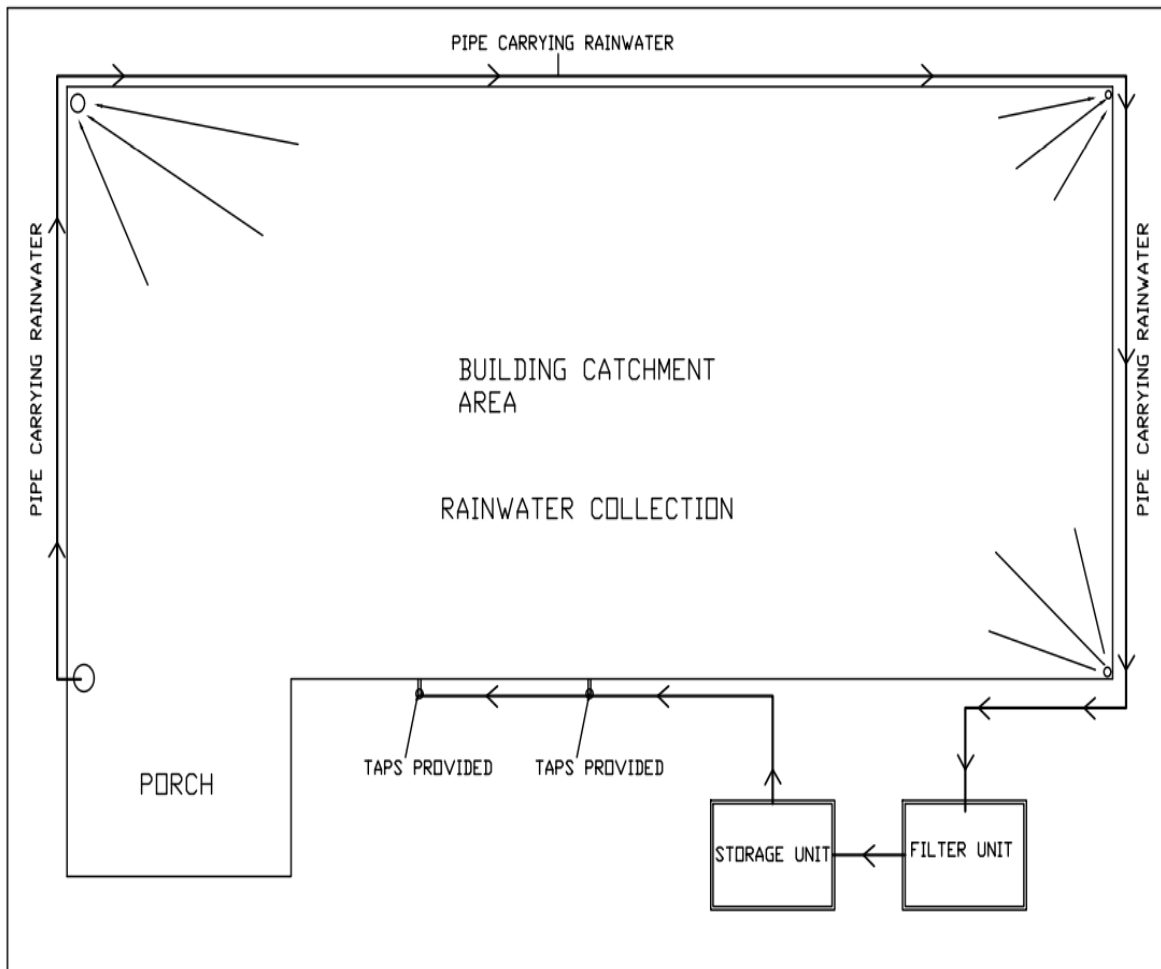
Different parameters that we have consider are-

- Rainfall and climate
- Drainage of Chhattisgarh
- Temperature of Chhattisgarh
- Soils of Chhattisgarh
- Hydrological conditions of Chhattisgarh
- Depth of water level in chhattisgarh

4. LAYOUT AND DESIGN OF RAINWATER HARVESTING SYSTEM IN BUILDING-

Description of layout-

Here in the above layout plan we have shown a building contains boundary wall and porch and different units open garden area . The rainwater is collected in the roof which is shown as Catchment area and slopes are provided so that the water will be collected on the corners of the roof and then with the help of pipe provided around the building carry the collected water and flow to the ground surface where there is a filter unit in which the water will be collected and filtration of water will be done then after filtration fresh water will be stored in the storage unit. There are two taps are provided in the near porch area in which the stored rainwater will be used for the different utility purpose and household purpose as per



Design of tank:

Estimation of water quantity based on Number of persons and per capita demand, it not depend on how size is home. Per capita demand is volume of Water in litres used by one person in one day, that's help in deciding the water tank size and water consumption per day. If the building is residential we consider 200l/p/d water demand.

Water requirement (Volume) = No. of persons \times per capita demand

First of all we need to be sure of per capita demand. Actually it varies based on location and income. According to Indian standard water per capita demand is approx 135litres per person per day for lower income group and approx 180litres to 200litres per person per day for medium and higher income group. if the building is residential we consider 200l/p/d water demand.

So based on the number of individuals and per capita demand we can calculate the size of tank.

Area = $a \times a$ (Square) or Length \times Breadth (Rectangular),

suppose we are considering a family consist of 5 people.and we shall take 200 l/p/d water demand then water requirement will be

Water requirement (volume) =No. of persons X per capita demand

=5X200=1000 litres per day

after tank size will be based on the volume so

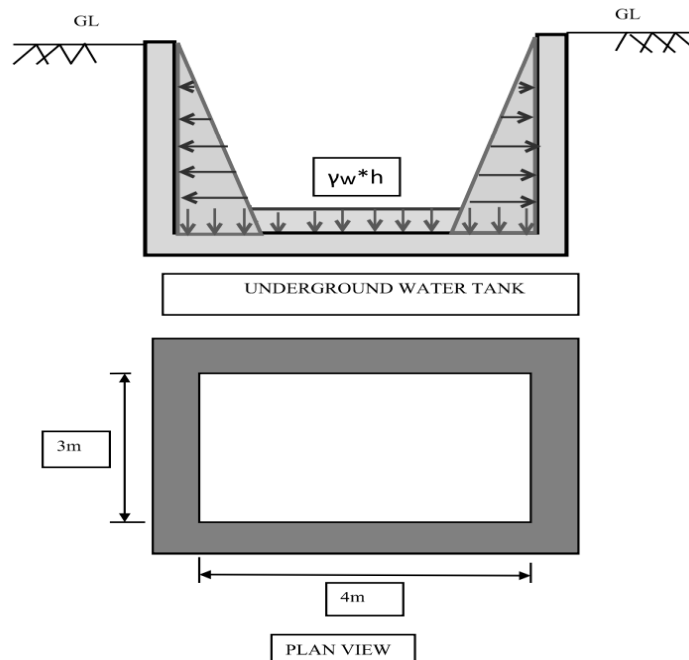
Volume=Depth x area

Area = a x a (Square) or Length x Breadth (Rectangular),

Capacity is 1 m³ and considering square tank so take depth as 1.8 m and one side as 0.75m so the size of tank will be =1.8m X0.75mX0.75m

The Rcc tank will be designed and various soil pressure and others design parameters will be adopted based on that calculation bars and reinforcement are provided in the tank.

Underground water tank: in this case, hydrostatical pressure acts on the wall. Weight of surcharge acts on the tank. When the tank is empty, the surrounding pressure of soil external walls. Because of its expansion and contraction properties.



Filtration of Rainwater:

- 1) Charcoal Filter-
- 2) Sand Filter
- 3) Pvc Pipe Filter-

Treatments of rain water harvesting-

- 1) Chlorination
- 2) Boiling
- 3) Sunlight

5. RESULTS AND DISCUSSION

The best source of pure water in present time is rain water. As we have selected our area as Chhattisgarh . we have collected previous rainfall data records. If it is implemented and adopted by peoples then this could reduce the water problem up to great extent. About 50 % of the requirements of the daily household water need can be fulfil by adopting RWH system.

By studying the concept and data and implementation techniques in above case studies and papers we are going to design an effective Rain water system for a building in a simple and effective ways which can be implement in the Chhattisgarh.

The government and regulatory bodies play major role in RWH. It can be concluded that RWH, though needs initial investment, helps in preserving most precious gift from the nature, which is priceless and most valuable assets

6. CONCLUSION AND SCOPE OF WORK

The best source of pure water in present time is rain water. As we have selected our area as Chhattisgarh . we have collected previous rainfall data records. If it is implemented and adopted by peoples then this could reduce the water problem up to great extent. About 50 % of the requirements of the daily household water need can be fulfil by adopting RWH system.

The school complexes, commercial hubs and office premises have large potential for rainwater harvesting. The use of proper technology for rainwater harvesting needs to be considered as an important factor.

The communities should be made aware of the water scarcity issues and importance of RWH. Along with RWS, there is need to create awareness about proper use of water.

The government and regulatory bodies play major role in RWH. It can be concluded that RWH, though needs initial investment, helps in preserving most precious gift from the nature, which is priceless and most valuable assets

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REFERENCES

- [1] Review on Design of Rooftop Rainwater Harvesting in Nimgaon VillageA Case Study of Junnar Tahsil (Maharashtra)
- [2] Rainwater Harvesting (RWH) System for Individual Houses in India-G Arvind kumar.
- [3] Government of india ,ministry of jal shakti,department of water resources,central ground water board,ground water year book of chhattisgarh 2019-2020
- [4] Water resource department ,Government of chattisgarh “manual ondesign of Artificial recharge structure in Chhattisgarh.
- [5] Grewal, S.S., Mittal, S.P., Agnihotri, Y., Dubey, L.N., 1989. Rainwater harvesting for the management of agricultural droughts in the foothills of northern India. Agric. Water Manage., 16, 309-322