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DESIGN AND ESTIMATION OF RAINWATER HARVESTING

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Abstract - Water scarcity is serious problem throughout the world. The increase in population , Urbanization, industrial development has resulted in overexploitation of groundwater & surface water resources the conventional water sources namely well, river and reservoirs, etc. are inadequate to fulfill water demand due to unbalanced rainfall .While the rainwater harvesting system investigate a new water source. The aim of the present study is to use rainwater and thus taking close to the concept of nature conservation. In this study, the rain water harvesting (RWH) system is analyzed as a alternative source of water to the BBDITM E-block.The development system satisfies the social requirement and can be implemented in rural areas and urban areas as well by considering almost all the technical aspect.

Index terms – **Catchment, Coarse Mesh, Coarse Mesh, Conduits, Recharge structures**

Introduction

Rainwater harvesting is a technology used to collect, convey and store rain water for later use from relatively clean surfaces such as a roof, land surface or rock catchment. Roof top rainwater collection is one of the solutions for so living or reducing the problem of water availability, where there is inadequate ground water supply and surface sources are either lacking or insignificant. In this system, rainwater falling on roofs of houses and other buildings is collected through a system of pipes and rectangular channels of concrete or PVC and stored in tanks suitably located on the ground or underground for direct use or for recharging ground water aquifers. Urban housing complexes/residential buildings and institutional buildings have large roof area and are amendable for rainwater harvesting. This practice is in vogue at the individual household level in remote hilly areas with high rainfall and in some semi-arid areas in the plains. Rainwater harvesting is very simple technique to collecting the rainwater in the storage tank from where its falls, filtering it and for use is further , or we can recharge the groundwater as well rain water harvesting system is economically very cheap in construction as compare to other sources , i.e. well formation, canal forming, dam building etc.
Rainwater Harvesting is a simple technique of catching and holding rainwater where its falls. Either, we can store it in tanks or we can use it to recharge groundwater depending upon the situation.

Following is schematic diagram of RWH system

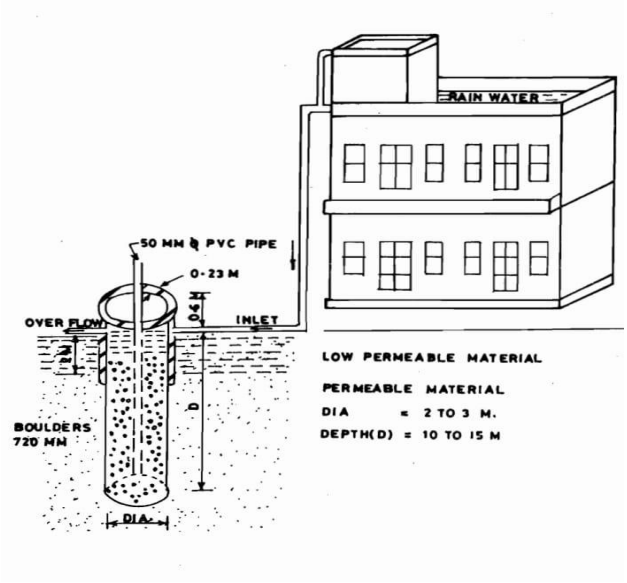


Fig. schematic diagram of RWH system

Features of Rainwater Harvesting are:

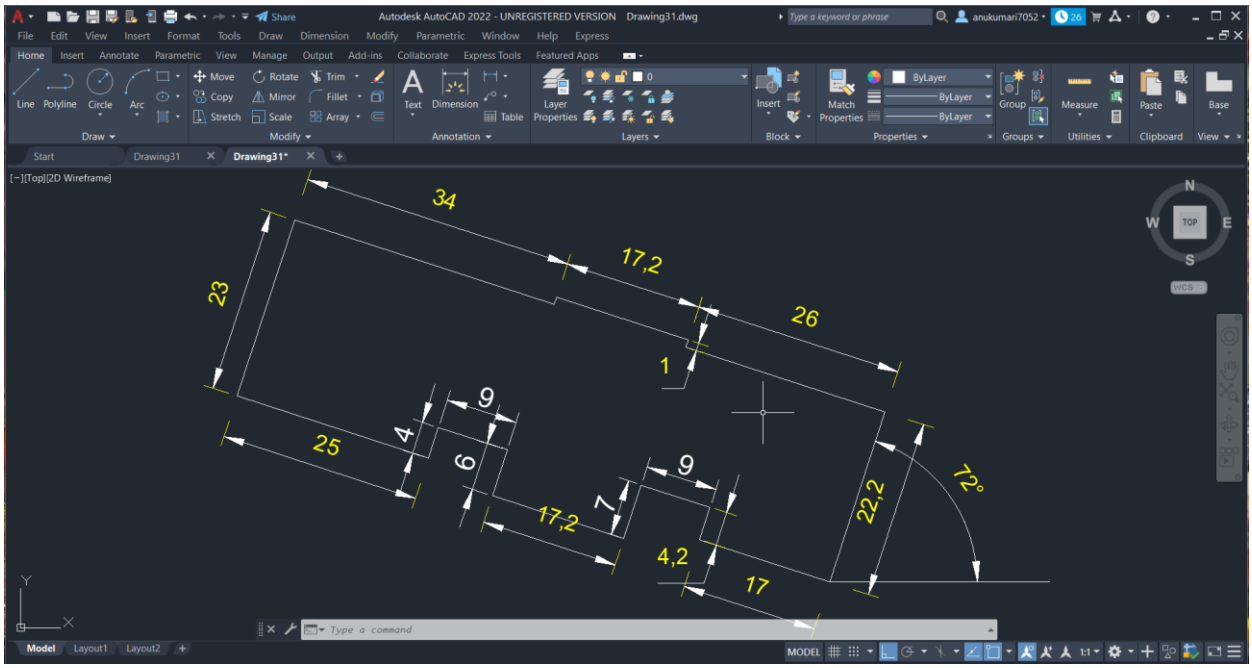
- Reduces urban flooding.
- Ease in constructing system in less time.
- Economically cheaper in construction compared to other sources, i.e. dams, diversion, etc.
- Rainwater harvesting is the ideal situation for those areas where there is inadequate groundwater supply or surface resources.
- Helps in utilizing the primary source of water and prevent the runoff from going into sewer or storm drains, thereby reducing the load on treatment plants.
- Recharging water into the aquifers which help in improving the quality of existing groundwater through dilution.

Rain Water Harvesting & Conservation, is the activity of direct collection of Rain Water. The conservation of Rain Water so collected can be stored for direct use or can be re-charged into the Ground Water. The main goal is to minimize flow of Rain Water through Drains / Nallahas to the Rivers without making any use of the same. It is a known fact that the Ground Water level is depleting and going down and down in the last decades. Thus Rain Water Harvesting & Conservation aims at optimum utilization of the natural resource, that is, Rain Water, which is the first form of water that we know in the hydrological cycle and hence is a primary source of water for us. The Rivers, Lakes and Ground Water are the secondary sources of water. In present times, in absence of Rain Water harvesting and conservation, we depend entirely on such secondary sources of water and in the process it is forgotten that rain is the ultimate source that feeds to these secondary sources. The value of this

important primary source of water must not be lost. Rain Water Harvesting & Conservation means to understand the value of rain and to make optimum use of Rain Water at the place where it falls.

METHODOLGY

We selected babu banarasi das national Institute of technology E-block , Faizabad road, Lucknow.



The following are design data-

No. of pipes of dia 100mm= 12

Annual rainfall in Lucknow as per CPWD = 1021.5 mm

Coefficient of runoff as per CPWD manual = 0.95

Length of drain of size 300×260 mm = 176 m

Length of drain of size 300×520mm = 15m

Calculation of Annual rainwater harvesting potential

$$V = K \times I \times A$$

V = Volume of water stored

K = Runoff coffecient

A = area

K = 0.95 (as per C.P.W.D. manual)

A = 1732.6 m^2

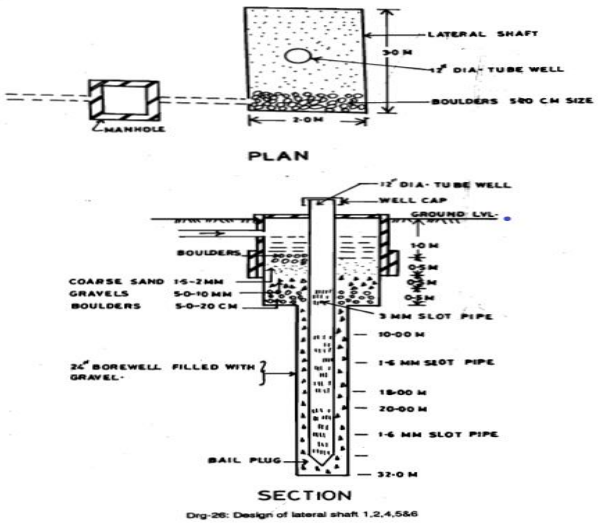
I = 1021 mm (as per table no.)

V = 0.95×1.021×1732.6 m^3

V = 1680.535 m^3

V = 1680.535 × 10^3 liters

The following is detailed design of recharge shaft



Drg-26: Design of lateral shaft 1,2,4,5&6

Outcomes of project

The roof to area of building is 1732.6 m^2. Runoff coffcient of 0.95. Without rain water harvesting system 1.680535×10^6 lt volume of goes into municipal drainage system and increases burden on water treatment plant. After building rain water harvesting system 1.680535×10^6 litres of water can be saved per year.

CONCULSION

Rain Water Harvesting from Roofs Consists of collecting, storing and putting to use rooftop rainwater from houses or any construction is rooftop rainwater harvesting. The sub-surface reservoirs are very attractive and technically feasible alternatives for storing surplus monsoon run off, the sub-surface reservoirs can store substantial quantity of water. The sub-surface geological formations may be considered as Warehouse for storing water that come from sources located on the land surface. Besides suitable litho logical conditions, other considerations for creating sub-surface storages are favorable geological structures and physiographic units, whose dimensions and shape will allow retention of substantial volume of water in porous and permeable formations.

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