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Rainwater Harvesting

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Abstract: ***One of the severe issues that is well recognized on the planet is the water scarcity. Overexploitation of groundwater and surface water resources is the outcome of population growth, urbanization, and industrial expansion. Due to uneven rainfall, the traditional water sources, such as wells, rivers, and reservoirs, are unable to supply all of the water needed .While a new water source is being investigated by the rainwater gathering system. Utilizing rainwater is the study goal, which is closely related to the idea of protecting the environment. This study examines the Rain Water Harvesting (RWH) system as a substitute for the BBDITM H-block as a source of water. By taking into account nearly all technological aspects, the development system satisfies social requirements and maybe implemented in both urban & rural areas.***
Keywords: Population growth, Urbanization, Industrial expansion, RWH.

I. INTRODUCTION

Despite astounding advancements in science and technology, nature continues to be a mystery to humans. The lack of water, even for drinking purposes, is a persistent problem all over the world, but it is most acute in developing and poor nations. Water is also obtained by desalination, artificial rain by cloud seeding, and other methods in some of the developed countries. From2007onward, India is anticipated to undergo "Water Stress," hence it will be important to change the focus of policy from "Water Development" to "Sustainable Water Development." The growing significance of groundwater artificial recharge and water harvesting is a key component of this shift in approach. Israel and Slovakia, for example, utilize water around four or five times before discarding. It is only ever used once in India before being discarded. This situation is undoubtedly not promising. The hydrologic cycle is the continuous flow of water from the atmosphere to the oceans and back again. All precipitation, including hail, rain, sleet, and snow, as well as all water comes from this cycle. Water from precipitation that has been held in streams, lakes, and soil evaporates, but water from transpiring plants forms clouds that hold the water in the atmosphere. Utilizing our State's finite and priceless resources as effectively as possible is crucial. Utilizing water-saving appliances and plumbing fittings is part of this avoiding water waste and utilizing alternate water sources like rainwater collection and grey water reuse.

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 the secondary sources. This vital primary source of water must not be lost for lack of value.

Understanding the value of rain and making the most use of it where it falls are two aspects of rainwater harvesting and conservation.

II. COMPONENTS OF RAIN WATER HARVESTING SYSTEM

A water collecting framework comprises of parts for separating, moving water through lines or depletes, and putting away gathered water in tanks.

The regular pieces of a water assortment framework are:

1) *Catchments:* The surface which straightforwardly gets the precipitation and gives water to the framework is called catchment region. It tends to be a cleared region like a patio or yard of a structure, or an unpaved region like a grass or open ground. A rooftop made of supported concrete cement (RCC), electrifies iron or creased sheets can likewise be utilized for water reaping.
2) *Coarse Mesh:* Channels which encompasses edge of an inclining rooftop to gather and ship water to the capacity tank. Drains can be semi-round or rectangular and for the most part made locally from plain stirred iron sheet. Drains should be upheld so they don't hang or tumble off when loaded with water. The manner by which drains are fixed primarily relies upon the development of the house, for the most part iron or lumber sections are fixed into the walls.
3) *Conduits:* Courses are pipelines or channels that convey water from the catchment or roof region to the reaping framework. Generally accessible channels are comprised of material like polyvinyl chloride (PVC) or aroused iron(GI).

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4) *First-flushing:* A first flush gadget is a valve which guarantees flushing out of first spell of downpour away from the capacity tank that conveys a moderately bigger measure of poisons from the air and catchment surface.
5) *Filters:* The channel is utilized to eliminate suspended poisons from water gathered from housetop water. The Different sorts of channels commonly utilized for business intention are Charcoal water channel, Sand channels, Even roughing channel and slow sand channel.

III. LITRATURE REVIEW

A. J.R.Julius, Dr.R.Angeline Prabhavathy, Dr.G.Ravikumar

As the world population increases, the demand increases for quality drinking water. Surface and groundwater resources are being utilized faster than they can be recharged. Rainwater harvesting is an old practice that is being adopted by many nations as a viable decentralized water source. This paper reviews the methods, design of rainwater harvesting systems, and its impacts adopted in all parts of the world.

B. Dr. P.D. Sabale, Prof. S.J. Yadav

Water is the most important resource on the earth. Which require water for various activities in our dayto- day life At the rate in which India's populace is expanding, it is said that India will without a doubt supplant China from its main position of most thickly populated nation of the world. This will prompt high rate of utilization of most significant characteristic asset "Water" bringing about expansion of weights on the allowed freshwater assets and supply of it is decreasing at a rapidly safe on this planet. Keeping in mind the end goal to ration and take care of our day by day demand of water prerequisite, we have to think for elective savvy and moderately simpler mechanical strategies of conserving water.

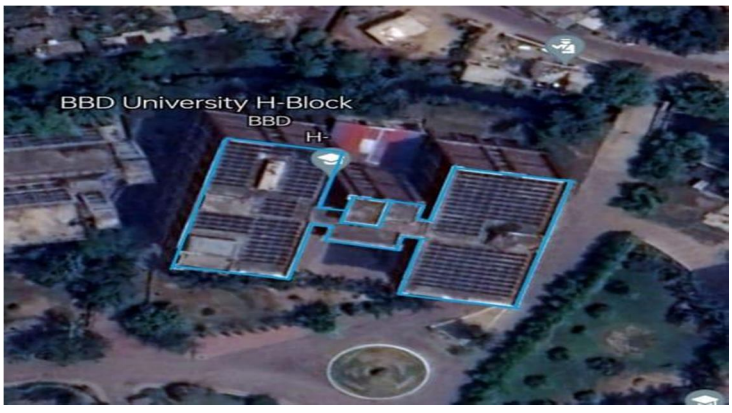
C. Abhijeet Keskar, Satish Taji, Rushikesh Ambhore, Sonali Potdar, Prerana Ikhar and Ragulwar D.G.

Water scarcity is serious problem through out the world for both urban & rural community. Urbanization, industrial development & increase in agricultural field & production has resulted in overexploitation of groundwater & surface water resources and resultant deterioration in water quality. 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.

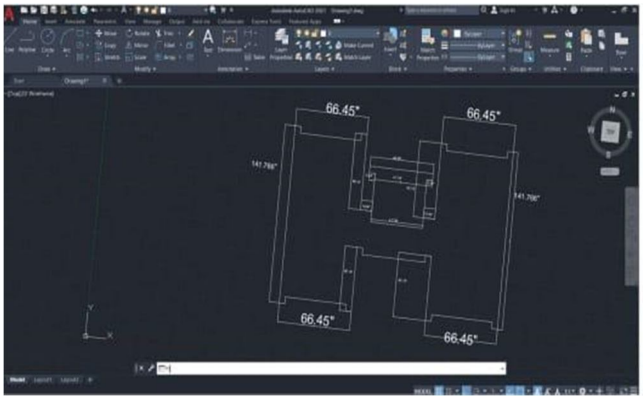
D. Sunil J. Kulkarni

Water scarcity is a major problem faced by the world. Increasing demand of water because of growing population and rapid industrialization is unavoidable. Proper and sensible use of available water resources and recycling of water in domestic and industrial applications can help to reduce water demand. Rainwater harvesting (RWH) can solve the water problem to considerable extent. Roof top RWH in domestic household structure can fulfill more than 50 percent water demand. The educational and business complexes are also implementing RWH successfully. It is envisaged to make the RWH technologies more effective and economical. Many times initial investment becomes limiting factor in adopting RWH technology. So technological up gradation and awareness among people based on long term benefits of RWH can drive more people to adopt RWH. The current review summarizes research, studies and surveys carried out to study, analyze and implement RWH

IV. SELECTION OF SITE AND COLLECTION OF DATA



Satellite image of BBDITM building



Drawing plan

A. Calculations

Area of the site - 1986.8m2

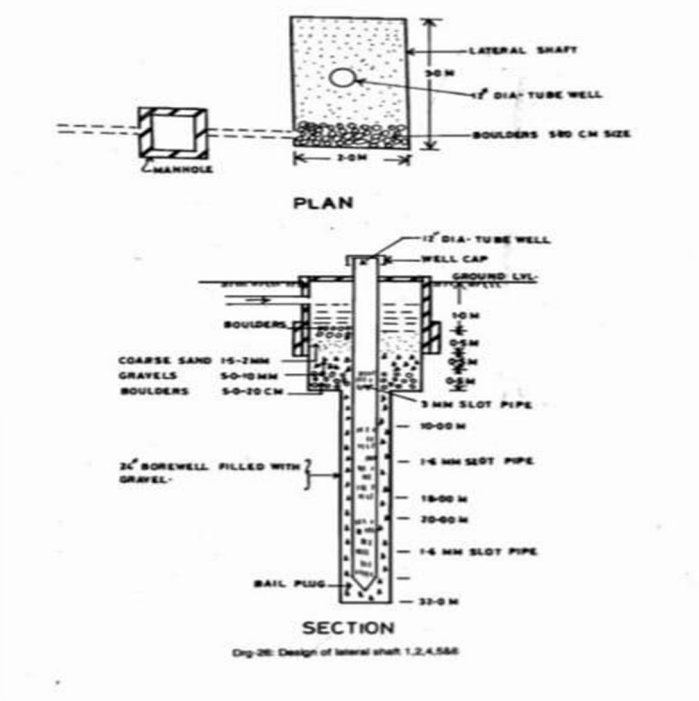


FIG.12 (Detailed drawing of structure)

Calculation of Annual rainwater harvesting potential

Q= K.I.A

V = Volume of water stored
K = Runoff coffecient
A = area
K = 0.95 (as per C.P.W.D. manual)
A = 1986.8m^2
I = 1021 mm (as per table no.)

V = 0.95×1.021×1986.8 m^3
V = 1927.096 m^3
V = 1927.096 × 10^3 litres

B. Calculation of Max Discharge

According to empirical formula-

$$Q=C.I.A$$

Where,
Q = discharge
C = runoff coefficient on rooftop
A = area of roof
I = Max Intensity of rainfall
For the first Area :-
C = 0.95
A = 1986.8m^2
I = 20 mm/hr
Q = 0.9520×10^{-3}
× 1986.8 m^3/sec
60×60
Q = 10.485× 10^{-3} m^3/sec
Q = 10.485 ltr/sec

C. Calculation of Number of Pipe Required for Terrace Area

Assume Diameter of pipe = 0.1m
By using empirical formula

$$N= Q/0.785d^2 X v$$

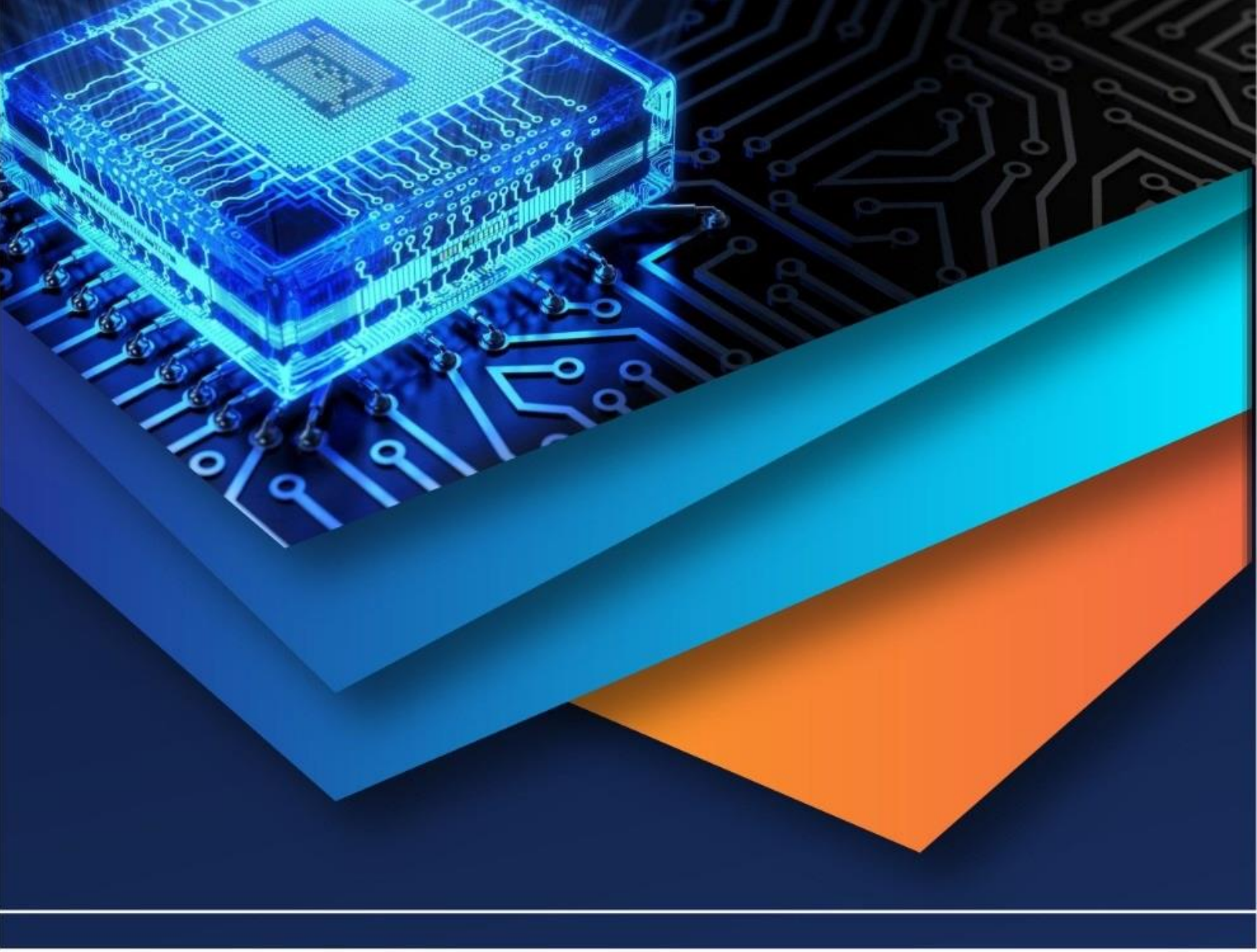
Where,
Q = Discharge
d = Diameter of pipe
V = velocity of runoff on rooftop
V = 0.1 m/sec (taken as per CGWB recommendation)
N= $10.485\times10^3/0.785(0.1)^2x0.1$
N = 13.5466 pipes

V. CONCLUSION

Rain Water Harvesting from Rooftops Comprises of gathering, putting away and putting to utilize roof water from houses or any development is roof water reaping. The sub-surface repositories are extremely appealing and in fact practical options for putting away excess storm run off, thesub-surface supplies can store significant amount of water. The sub-surface topographical developments might be considered as Distribution center for putting away water that come from sources situated on the land surface. Other than fitting the legitimate circumstances, different contemplations for making sub-surface stockpiles are good land structures and physiographic units, whose aspects and shape will permit maintenance of significant volume of water in permeable and porous developments.

In our above Project we saved 1927.096 × 103 litres of water from Catchment Area of 1986.8m2
which have runoff coefficient of 0.95. Total cost of constructions came out to be 4,91,745 rupee.

The main purpose of the rainwater harvesting is to use the locally available rainwater to meet water requirements throughout the year without the need of huge capital expenditure. This would facilitate the availability of uncontaminated water for domestic, industrial, and irrigation needs.



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