



Design and Estimation of Rain Water Harvesting Scheme in VIVA Institute of Technology

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Abstract: Vasai-Virar region of Palghar District in Maharashtra receives an ample rainfall every year of about 2300 mm. Due to the scarcity of ground water and scanty rainfall in the dry summer months in this region, this paper proposes a rain water harvesting scheme utilizing the roof of VIVA Institute of Technology as catchment area and then designing a reservoir and estimating the cost of the scheme so that the project can meet the water requirement of the Institute.

Keywords -Rain Water harvesting, VIVA Institute of Technology, Water reservoir design, Rainfall At Vasai-Virar, Water Filtration

I. INTRODUCTION

The rising concern of fast ground water depletion in Maharashtra, lack of rainfall throughout the year and poor water management issues gives us scope as an engineer to think what at least we can do from our end. Rain water harvesting is definitely on top of the list. VIVA Institute of Technology has got ample roof space and Vasai-Virar region is blessed to receive substantial rainfall. So water crisis management is doable.

II. ROOFTOP RAINWATER HARVESTING

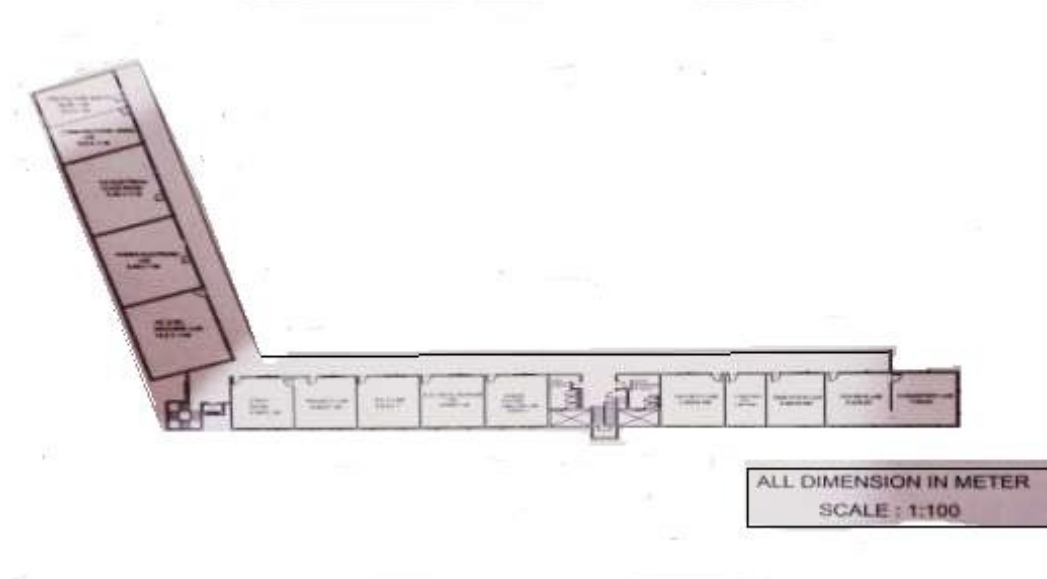


Figure1: Total roof area

Considering only the L shaped Technology building we are calculating the area of the roof. For convenience of calculation we have excluded the staircase portions and have taken into consideration on those are where ample amount of rain can be captured. So losses are already included. For calculation of total area marked in red are only taken into consideration

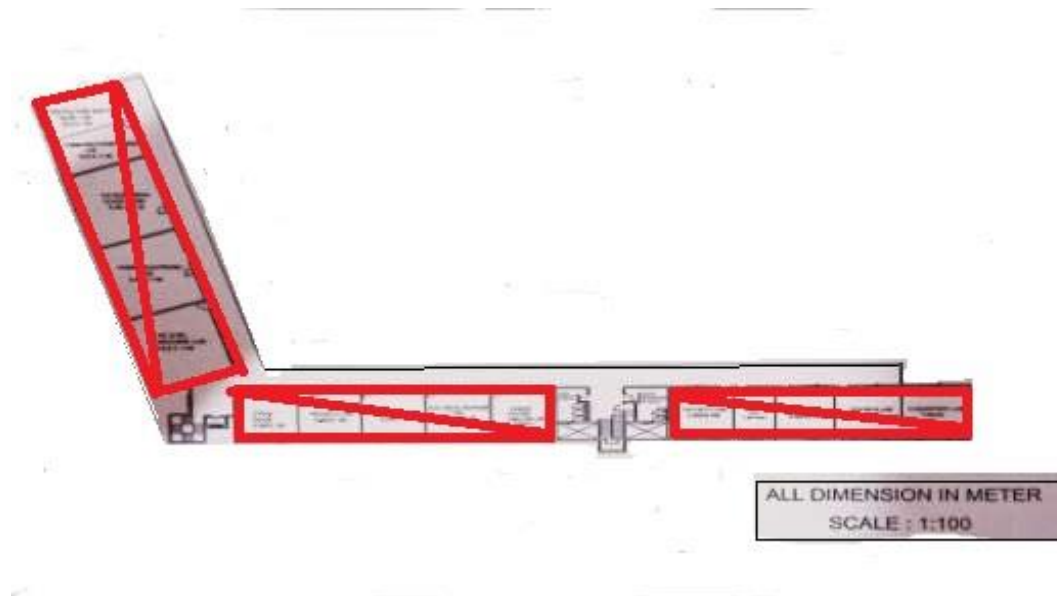


Figure 2: Total area under consideration for rain water harvesting

$$\begin{aligned}
 \text{Total area} &= \{11 \times (12.6 + 12.8 + 6.3 + 6.3 + 12.8)\} + \{7.1 \times (8.5 + 8.5 + 8.6 + 8.6 + 8.5)\} + \{8.6 \times (5.8 + 5.3 + 8.5 + 7.5)\} \text{ sq m} \\
 &= 558.8 + 303.17 + 230.48 \text{ sq m} \\
 &= 1092.45 \text{ sq m} \\
 &= 11759.03393 \text{ sq feet}
 \end{aligned}$$

There are wide range of filters options to be installed for proper filtration of the water capture during the rainy season. There are particles big and small, which can affect the conditioning of the reservoir and hence need to be addressed properly before the water flows in to the reservoir. So, to do that we can install the filter unit in the pipes or we can directly filter the water in the reservoir.

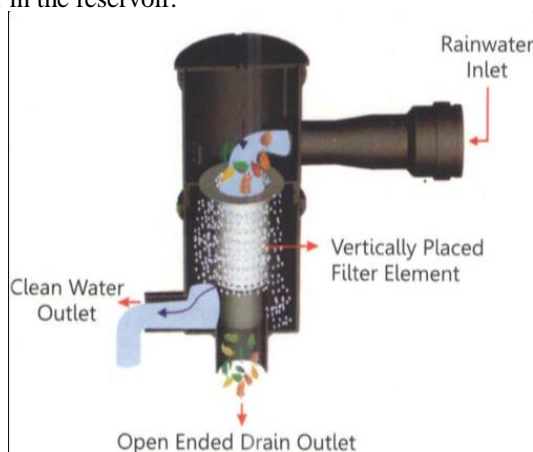


Figure 3: In-pipe Pressure filter

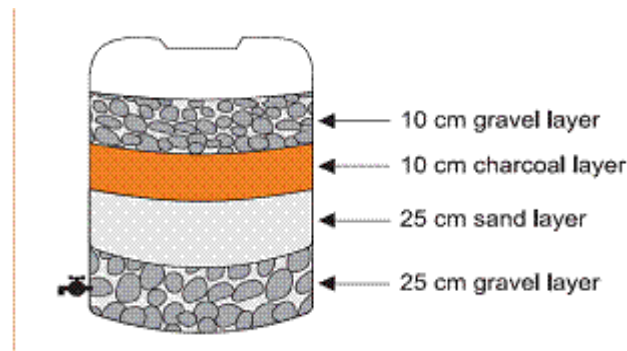


Figure 4: filter in the reservoir

III. AMOUNT OF RAIN

It is estimated that Shirgaon area of Virar East receives 2300 mm of annual rainfall. If considering all losses we assume this figure to be 2000mm, then we can calculate the amount of rain water that can be harvested. 1 lakh litre water harvest is possible for 1000 sq feet. Therefore, for 11759.033 sq feet 11.759 Lakh Litre

IV. RESERVOIR

The shape of any catchment area has a considerable influence on the catchment pattern. Various types of roof provide different choices. Like single pitch roof where the entire water can be drained into a single gutter. Flat roof of the institutes premises will make the collection of water very easy. Owing to the usage of the water in the Institute Direct-Pumped is one of the professional types of rainwater harvesting where a submersible pump is used particularly in domestic settings and is the easiest system to install. The pump is placed within the underground tank and the harvested water is pumped directly to WCs or other appliances used daily for domestic purposes.



Figure 5: Reservoir Strategy

V. COST & CONCLUSION

It is estimated per 1 lakh litre the cost of rain water harvesting will fall around 6 to 7 lakh INR. So if 11 lakh litre the total cost of establishment would fall around 66 to 77 lakh INR.

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