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DESIGN OF RAINWATER HARVESTING SYSTEM IN SANSKRITHI SCHOOL OF ENGINEERING.

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ABSTRACT :

Rainwater harvesting is a simple technique of catching and holding rainwater where it falls and the system is economically cheaper in construction compared to other sources like dams, diversions etc. The present study focuses on finding the potential for Rainwater harvesting method, is a simple technique of catching and holding rainwater where it falls and the system is economically cheaper in construction compared to other sources like dams, diversions etc. In this project, finding the potential for water saving by using rainwater in engineering block at Sanskrithi school of engineering, Puttaparthi. Sanskrithi School of Engineering is in the southern state of Andhra Pradesh in India. The roof top of the college is 1177.45-meter square. And by using average rainfall data, calculations for rainwater endowment are 821.365 meter square and water harvesting potential is 739.2285 meter cube. Volume of water that can be collected in one year is 7,40,000 liters. Suitable hydro cyclone for removing suspended particles and reducing turbidity has been recommended. The project cost was calculated making use of prices prevailing currently in India.

KEY WORDS: Rain water harvesting,Hydro cyclone.

1.INTRODUCTION :

Rainwater harvesting is the collection and storage of rain, rather than allowing it to run off. Rainwater is collected from a roof like surface and redirected to a tank, cistern, deep pit (well, shaft, or borehole), aquifer, or a reservoir with percolation, so that it seeps down and restores the ground water. Dew and fog can also be collected with nets or other tools. Rainwater harvesting differs from storm water harvesting as the runoff is typically collected from roofs and other area surfaces for storage and subsequent reuse. Its uses include watering gardens, livestock, irrigation, domestic with proper treatment, and domestic heating. The harvested water can also be committed to longer-term storage or ground water storage.

2.STUDY AREA

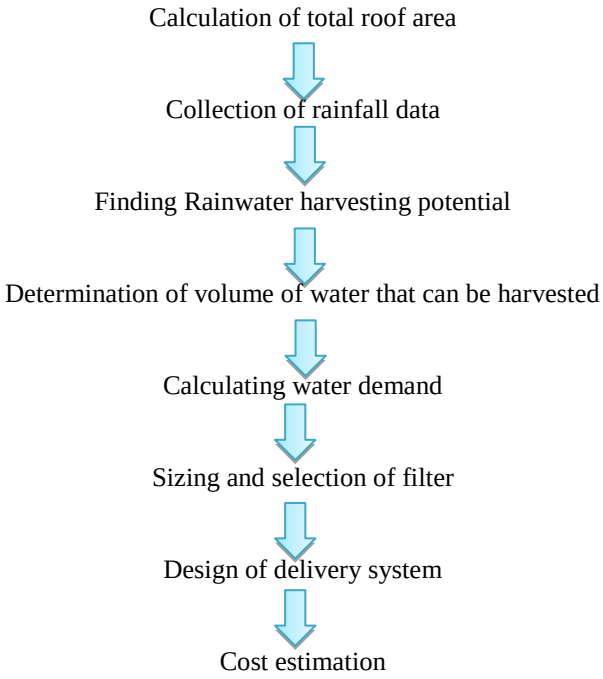
The campus of Sanskrithi school of engineering college Puttaparthi, is situated at 14.1160° N latitudes and 77.7996 °E longitudes and is located at Puttaparthi in Sri Sathya Sai District region of Andhra Pradesh. Study area of Sanskrithi school of engineering college. The total area of the campus is of 40 acres in that Engineering block is the catchment area and combined with couple of blocks as A1, A2, A3, A4. The catchment area has RCC roof the runoff co-efficient is taken as 0.9 and RWH system is designed to this study area.

Fig 1.1: Study area of SSE college.

3.METHODOLOGY

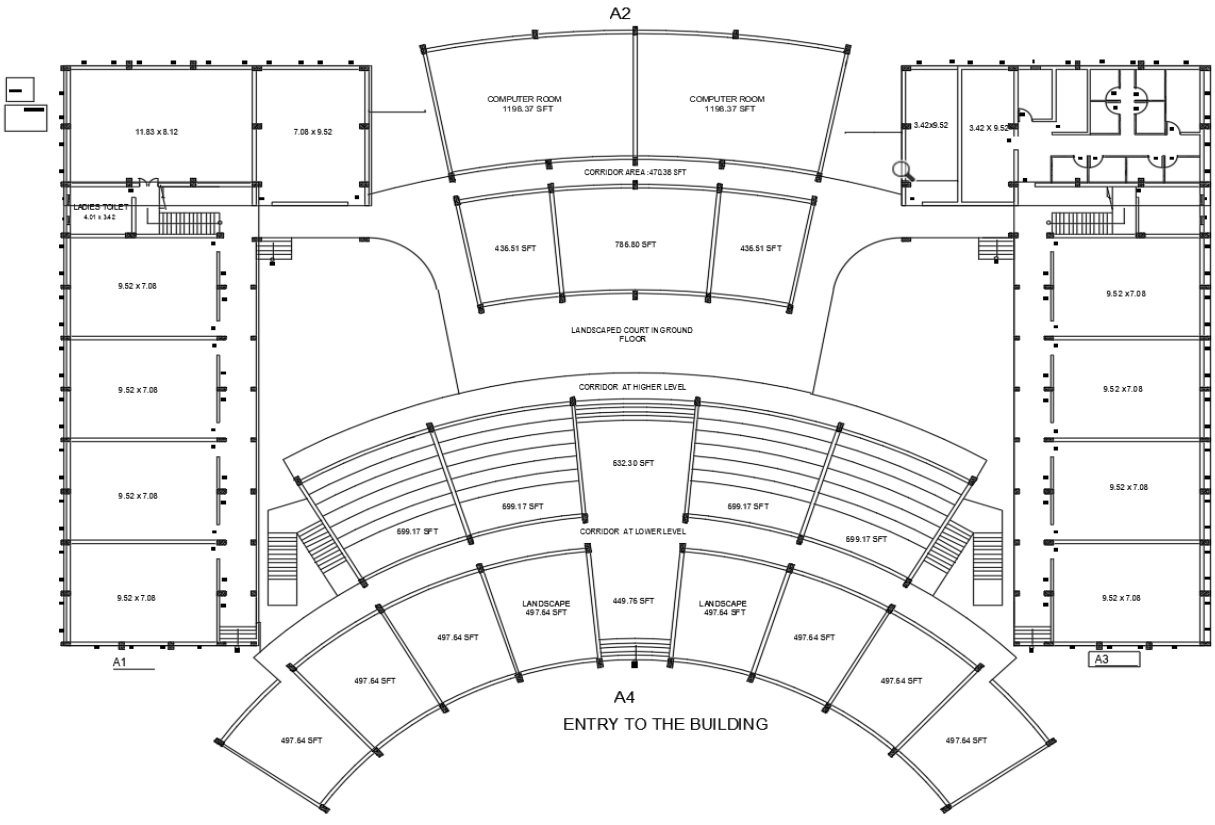
Rainwater harvesting is a process that collects, stores, and treats rainwater for later use. It can be a sustainable way to supplement your water supply and reduce your reliance on municipal water. The first step in planning rainwater harvesting project is to collect rainfall data for your area. This will help you determine how much rainwater you can potentially collect.

Flow chart of Methodology:



Once you have this information, you can calculate your water demand to see if rainwater harvesting is a viable option for you. If you decide to move forward with a project, you will need to design delivery system to transport the collected rainwater to where it will be used. This may include gutters, pipes, and a storage tank.

Calculation of roof top area:



Block A1 = 71.74 m^2
Block A2 = 303.77 m^2
Block A3 = 71.74 m^2
Block A4 = 730.2 m^2
Total Catchment area = A1 + A2 + A3 + A4.
= 71.74 + 303.77 + 71.74 + 730.2
= 1,177.45 m^2

- The total catchment area of SSE block is 1,177.45 m^2.

Collection of rainfall data:

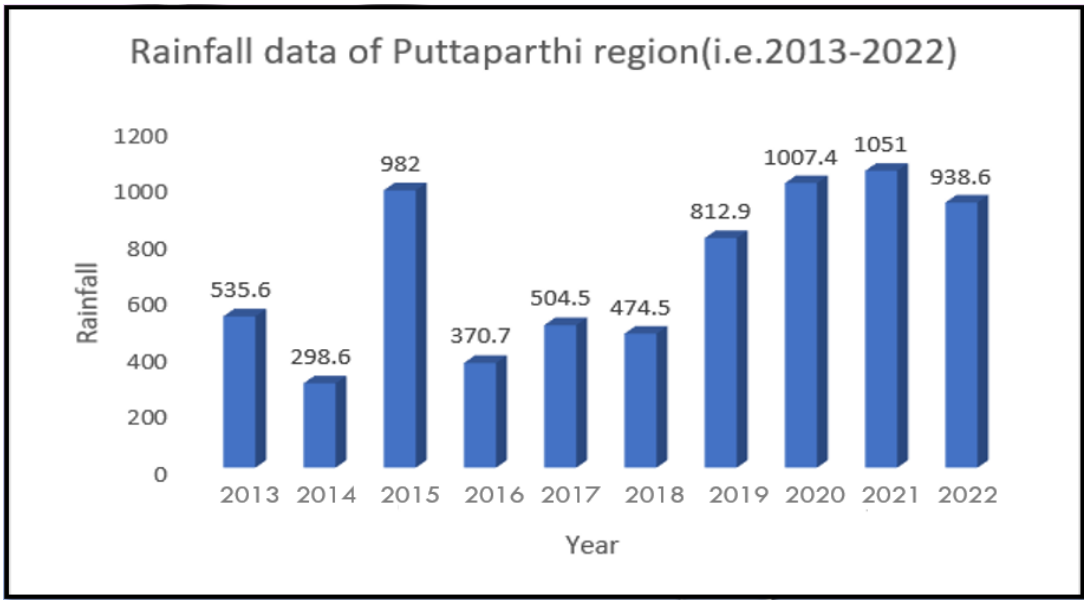


Fig.3: Bar graph representation of rainfall data of Puttaparthi.

Calculating average rainfall data:

Average rainfall data = (535.6 + 298.6 + 982 + 370.0 + 504.5 + 474.5 + 812.9 + 1007.4 + 1051 + 938.6) / 10
= 6975.8 / 10
= 697.58 mm
Converting from mm to meter
= 697.58 / 1000
= 697.58 x 10^{-3}

Finding RWH (Rainwater harvesting) Potential:

1) Rainwater Endowment = Rainfall x Catchment area.
= 697.58 x 10^{-3} x 1177.45 m^2
= 821.365 m^2
2) Rainwater harvesting potential = Rainwater endowment x Runoff co-efficient.
= 821.365 x 0.9
= 739.2285
= 740m^3

Calculating water demand:

Water demand refers to the total amount of water needed for various purposes by humans and the environment. Water demand isn't just about total volume; it's also about when and where we need water. Cities see peak demands in summer for lawns and showers, while farms require consistent

irrigation. Understanding these variations helps us optimize water distribution systems and implement targeted conservation strategies during high-demand periods.

S.NO	Activity	Water consumption
1	Gardening	200 liters
2	Toilet flushing	5 liters
3	Washing of rooms	50 liters

Table.1: Water consumption for different activities.

Number of students in college = 1000

Toilet flushing = Water * No. of students (approx.) * 365

= 5*50*365

= 91,250 liters

Washing of rooms = Water * No. of days

= 50 * 365

= 18,250 liters

Gardening = Water * No. of days

= 200 * 365

= 73,000 liters

Total water demand = 1,82,500 liters

Hence, water demand = 1,82,500 liters/year

4.CONCLUSIONS:

This project deals with aspect of improving the rain water availability in the Sanskrithi School of Engineering, Puttaparthi campus by implementing Rain water harvesting (RWH) system. This implementation of RWH system can last for many years providing water for domestic and other uses. A little maintenance and manual work are needed to clean the catchment area, storage tanks and hydro cyclones. This work focused on implementing rainwater harvesting for the SSE campus, around 1000 students are attending the college every year.

- Catchment area for Sanskrithi School of Engineering campus was calculated as 1177.45 m^2
- Rainwater endowment for the area has been computed to be 821.365 m^3.
- Assuming a run off coefficient 0.9, RWH potential is calculated as 7,40,000 liters/year.
- A layout (piping diagram) has been proposed which includes two hydro cyclones for separation of suspended particles. List of parts have been identified and cost estimation was made. The total cost for implementing RWH system worked out to be Rs. 1,39,571.

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