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Rain Water Harvesting: Analysis and Design for the ITM Universe, Vadodara Campus

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Abstract — *This paper presents the system of rain water harvesting as a practical solution at the ITM Universe, Vadodara campus. Detail study has been done and based on that analysis for the system is carried out by providing rain gauge stations in the campus at various points. Based on that, collection of water and storage of runoff water, which may be utilised for the irrigation purpose or daily routine utility purpose. By doing this we can provide the sustainable development in the campus. After that, for storing of water, design of water tank is carried out.*

Keywords- *rain water harvesting, sustainable development, water tank, garden irrigation.*

I. INTRODUCTION

Rainwater harvesting is a very old and most powerful technique in dry places on earth. To satisfy the water demand of people and for irrigation purpose it is very useful technique. The present scenario says drinkable water on the earth is reducing, further most of the people are utilising the ground water for their daily routine. Due that, it is the need of providing rain water harvesting at every new site and the sites where it is possible to provide the rain water harvesting. Government is also putting their efforts to provide the rain water harvesting in all the new sites constructed nowadays.

Apart from all other, it is moral responsibility of the human to store the water coming by the rain and utilization of the same will be beneficial for them only. We as a part of the society tried to provide the rain water harvesting in the ITM Universe campus at Vadodara in a way to have a green campus. As to provide rain water harvesting in the cam pus required various data and based on that proper system can be evaluated and existence of the system can be done.
As a part of the project work, we have generated the system of rain gauge. After utilization of the system we collected the average rainfall data month wise and year wise. After having the data and water demand in the campus, we have suggested the capacity of water tank which need to be constructed and design for the same has given.

Rain water harvesting is technique of collection of rain water into natural reservoirs or tanks, or the infiltration of surface water into subsurface aquifers. One method of rainwater harvesting is rooftop harvesting.Rainwater harevesting is a simple technique of catching and holding rainwater where its falls. Either, we can store it in tanks for further use or we can use it to recharge groundwater depending upon the situation.

II. LITERATURE REVIEW

ARPN journal of engineering and applied sciences. (Asian research publishing network)
Case study for rain water harvesting at Dhule(Dhulia) town. 50 house have rooftop and 43 is selected for RWH. Rooftop RWH is useful at that time when the municipal water supply is not sufficient to distribute water for whole town there for this method is use.

African journal of agricultural research
Case study at ranavi village in sangli. Population of this village is 1300 , 231 house at ranavi.70 house selected for RWH ,they are conclude that the water stored in storage tank is sufficient for entire population 1300 person for at least 45 days.
International journal of environmental sciences: Case study is hydrologic design of rain water harvesting system at Anna university at Chennai. Krishnaveni M is professor and Rajkumar L is research scholar , centre for water resources , department of civil engineering.

Rainwater harvesting system can be adapted to different range of climate zones; its is adaptable even to the hardest hit area by water crisis. Its very clear that rainwater has a major role to play in substituting or supplement urban water supply form metro water supply facilities.

III. METHODOLOGY

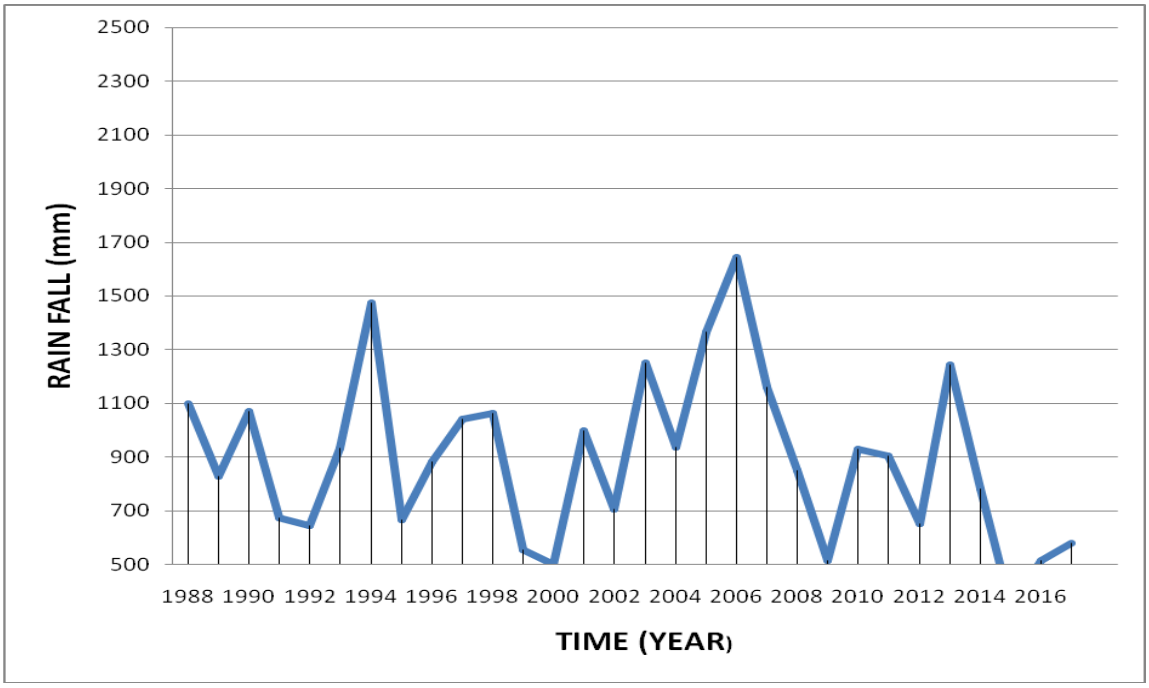
We had made rainguage station and collected data for daily, monthly and yearly basis. Selection of catchment area is done and analysis of data.

SITE SELECTION AND SELECTION OF CATCHMENT AREA:- In ITM UNIVERSE we choose area for collecting rain water is Chandrashekar Block and External building roof top area and open area between Chandrashekar block and Externnal building.

RAINFALL DATA:-

YEAR	RAINFALL (mm)	YEAR	RAINFALL (mm)	YEAR	RAINFALL (mm)
1988	1098.5	1998	1061.5	2008	849.9
1989	828.6	1999	553.9	2009	513
1990	1069.6	2000	500.7	2010	928.2
1991	672.7	2001	999.5	2011	903.7
1992	644.3	2002	704.8	2012	651.8
1993	934.2	2003	1250.1	2013	1243.7
1994	1473.9	2004	935.5	2014	780.6

1995	664.5	2005	1365.1	2015	344
1996	884.3	2006	1644	2016	514
1997	1041.2	2007	1159.5	2017	578



IV. DESIGN AND ESTIMATION

CATCHMENT AREA-1 (EB): –
Collected data:
1. Rooftop area - 950 m^2
2. Rainfall intensity – 0.1197 mm/hr
3.Runoff Co-officiant – 0.9
For Rooftop Discharge will be (Q) :–
$Q = C \times I \times A / 3.6$
$= 0.9 \times 3.325 \times 950 / 10^{-8}$
$Q = 0.0000284\ M^3/sec$

CATCHMENT AREA – 2 (CB) :-
Collected data:
1. Rooftop area – 920 mm^2
2. Rainfall intensity – 0.1197 mm/hr
3. Runoff co-efficiant – 0.9
For Rooftop Discharge will be (Q) :–
$Q = C \times I \times A / 3.6$
$= 0.9 \times 3.325 \times 920 / 10^{-8}$
$Q = 0.0000275\ m^3/sec.$

CATCHMENT AREA - 3 (OPEN AREA) :-
Collected Data:
1. Open area – 1244.83 m^2
2. Rainfall intensity – 0.1197 mm/hr
3. Runoff co-officiant – 0.85
For Open area Discharge (Q) Will be :
$Q = C \times I \times A / 3.6$
$= 0.85 \times 3.325 \times 1244.83 / 10^{-8}$
$= 0.0000350\ m^3/sec.$

V. CONCLUSION

By estimating the average rainfall or runoff, proper analysis and design has been done. By providing this, we can give feasible solution as Rain water Harvesting.

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