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## ROOF TOP RAIN WATER HARVESTING FOR WATER STORAGE AT LD COLLEGE OF ENGINEERING

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**Abstract:** Centre Gujarat is water scarce region. The rainfall is irregular in nature. Ground water is major source of water and that's why ground water is declining day by day. It has resulted in the disturbing depletion (3.57 m/yr) of water level & radical deterioration in ground water quality. In Ahmadabad average rainfall is below normal rainfall (855 mm). One of the simple methods of solving the problems of water & draught in different parts of a water harvesting is the collection of rain water from the different areas like roof of building, open spaces surrounding the building, farm-areas, etc. and then storing it for a later use or diverting it to an existing well for recharging. Water is a major component of the environment and human being occupy the center stage in it. Water is needed for agricultural production, industries, for drinking and other purposes by the people, animals, municipal and commercial use. One of the simple methods of solving the problems of water & draught in different parts of a water harvesting is the collection of rain water from the different areas like roof of building, open spaces surrounding the building, farm-areas, etc. and then storing it for a later use or diverting it to an existing well for recharging.

**Keywords:** Roof, Water Storage, Harvesting

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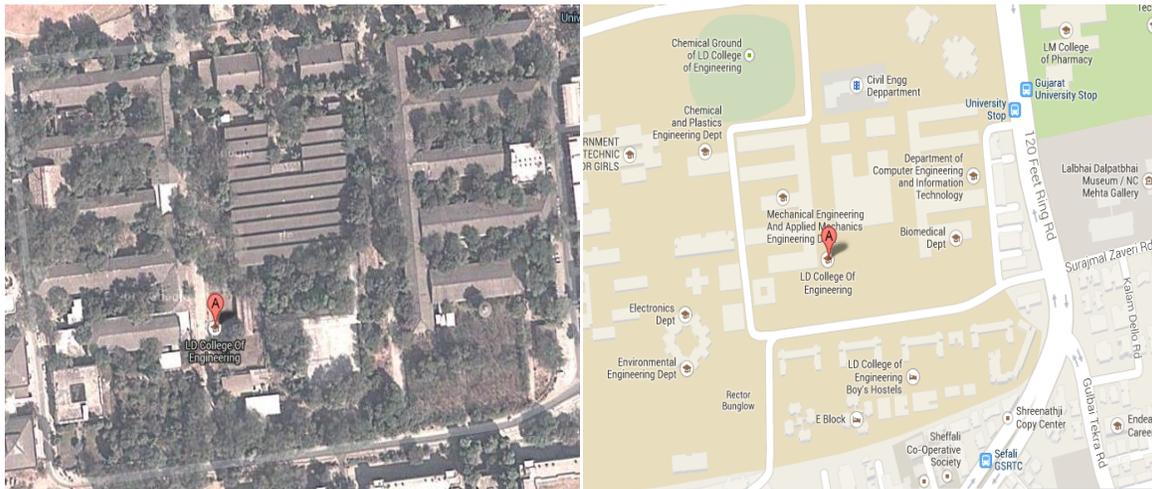
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## INTRODUCTION



**Fig – 1 Google image of study area – LDCE (source. [www.google.com/maps](http://www.google.com/maps))**

Rain water harvesting is the accumulation/ deposition of rainwater for reuse before it reaches the aquifer.<sup>[1]</sup> Around third century BC, the farming communities in Baluchistan and kutch used rainwater harvesting for irrigation.[2] In Tamil nadu, rainwater harvesting was made compulsory. Rain water harvesting means collecting rain water from the top of roof and storage in the water tank. Generally two type of water tanks are utilised- under ground water tank and above ground water tank . When the first rainfall of the season occurs, the water accumulated on the roof top is contaminated with various toxic gases as well as the dust on the roof top. Hence this accumulated water is generally flushed off as it is not suitable for drinking purpose. The primary need of such system is that water accumulated on the roof top must flow down under gravity for the use and the storage tank must be well cleaned prior to the use.

“why we are providing roof top rain water harvesting in college building?” because now a days there are no reliable sources of water in the college. So problem is created for primary use of water. In such circumstances rain water harvesting can prove to be appropriate measure to conserve water .This conserved water can be used for cooking, bathing, washing clothes, toilet flushing and various hygienic purpose and finally if the rainwater is treated well then can be utilised for drinking purpose also.

Even after first flushing of accumulated roof top water, the water collected will consist of various impurities and hence will be unsuitable for the usage of the water[6]. So the accumulated roof top water is allowed to pass through charcoal filter or PVC filter after which water is supplied to the storage tank.

### WATER DEMAND FOR THE BUILDING LDCE

The information about the total numbers of students and staff, which are planned to be accommodated in the new building is given in appendix B. Water consumption is considered 30 litres per capita per day for educational building. Accordingly the water demand for the building is 30,000 litres per day and 84,00,000 litres (8400 m<sup>3</sup>) per year, considering 280 working days per year.

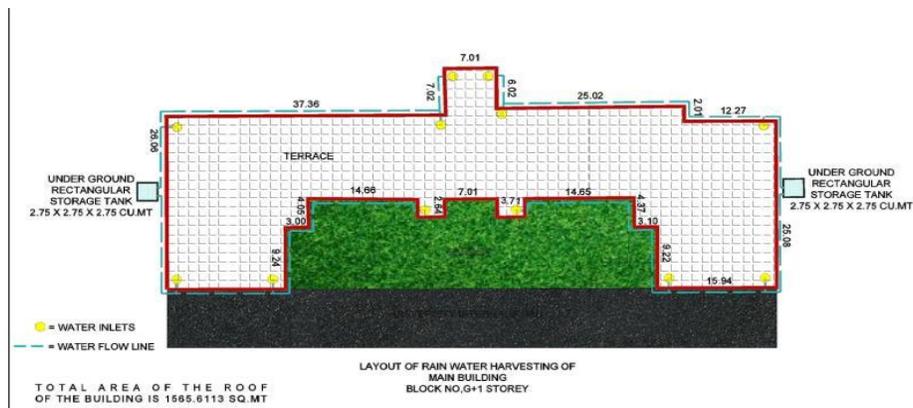
By considering different efficiencies of the system, rainwater that can be collected from the roof is shown in table.

**Table 1 Water Demand At LDCE**

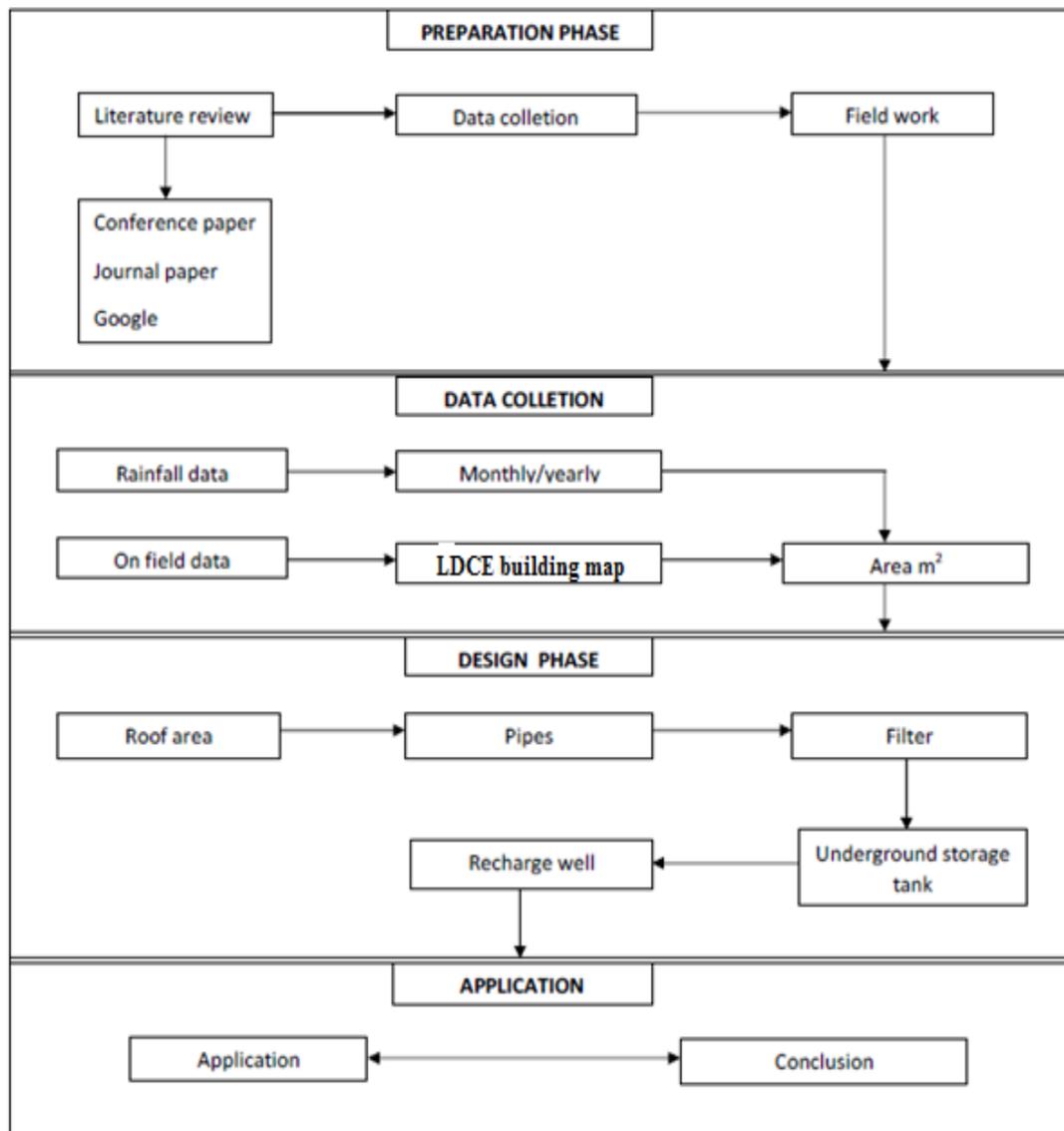
Efficiency of the system (%)	Rainwater collected (m <sup>3</sup> )	% of the annual demand
100	4510	53.6
85	3833	45.6
70	3157	37.5
50	2255	26.8

### STUDY AREA OF LDCE

The LDCE located at Ahmadabad . While LDCE is on 7 acres, . The campus holds separate hostels for male and female students and offers dining and shopping facilities. the area of roof top of LDCE building is 1565 M<sup>2</sup>



**METHODOLOGY**



**Technical data.**

For new LDCE building, a rooftop rainwater harvesting system is proposed. Last 13 years rainfall data are collected from agriculture department AHMEDABAD. The rainfall data are shown in table. The area of the roof is estimated on the basis of the drawing.

Year	Annual rainfall (in mm)
2001	921
2002	437
2003	720
2004	636
2005	1323
2006	1282
2007	1155
2008	560
2009	697
2010	730
2011	943
2012	1050
2013	1250

### Analysis and Design Steps

The methodology for the planning and designing of RRWH system is explained in following steps;

- 1) Select the appropriate path of pvc pipe connecting the storage tank.
- 2) The area of LDCE building is calculated and the planning for horizontal drain pipe on wall or gutter at the edge of sloping roof and vertical drain pipe on wall is done.
- 3) Area of roof top increased 19% for pitch more than 28°
- 4) The pvc pipes below ground are designed for the corresponding discharge and location of the water tank.
- 5) Design calculation of water tank;

Water available from roof =

Annual rainfall (in mm) X Area of roof (in sq m) X Efficiency of the collecting system

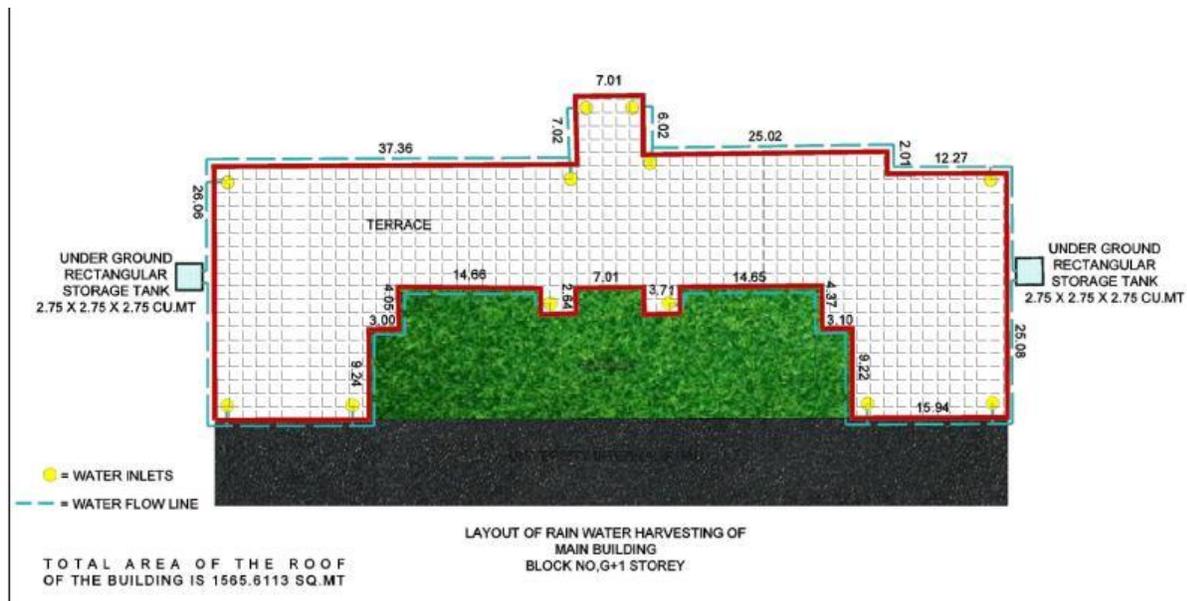
The average annual rainfall of the region is 854 mm. The roof area is 1565 m<sup>2</sup>. The efficiency of the system is considered as 85%.

Water available from roof =  $.855 \times 1565 \times .85 = 1137.225 \text{m}^3$

So, the desired capacity of the storage tank is  $1137 \text{m}^3$ .

Also it is suggested to collect the rainwater during magha nakshatra separately for the drinking purpose, as the rain in magha nakshatra ( end of August ) is considered beneficial and pure as per Hindu culture.

### 3 Provision of water tank Map



Water Tank Provision Map

### CONCLUSION:

With help of data collection and analysis of LDCE building, the roof top water harvesting is perfectly suitable for  $2700 \text{m}^2$  area. so we will collect 40,000 litre water in 2 tanks(p.v.c circular) during rainy season which can be useful for gardening purpose as well as drinking purpose in worst condition.

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