

## Roof Top Rain Water Harvesting for Water Storage at UVPCE, Ganpat University.

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### Abstract

North 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 alarming depletion (3.57 m/yr) of water level & drastic deterioration in ground water quality. In Mehsana average rainfall is below normal rainfall (647.10 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.

### 1. Introduction

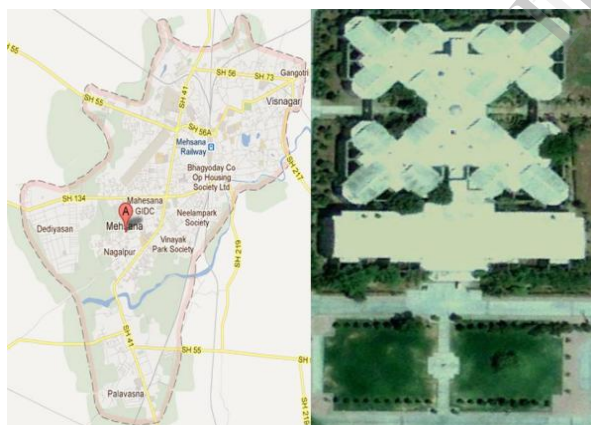


Fig – 1 Google image of study area – UVPCE

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.<sup>[2]</sup> 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. 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.

### 2. Description of study area.

The UVPCE located at latitude 23.528°N and longitude 72.458° E, about 12 km away from Mehsana. While UVPCE is on 25 acres, the entire educational campus contains more than 300 acres. The campus holds separate hostels for male and female students and offers dining and shopping facilities.the area of roof top of UVPCE building is 2700m<sup>2</sup>. And annual rainfall in GANPAT university is 980mm .(source: data obtained GANPAT university itself).

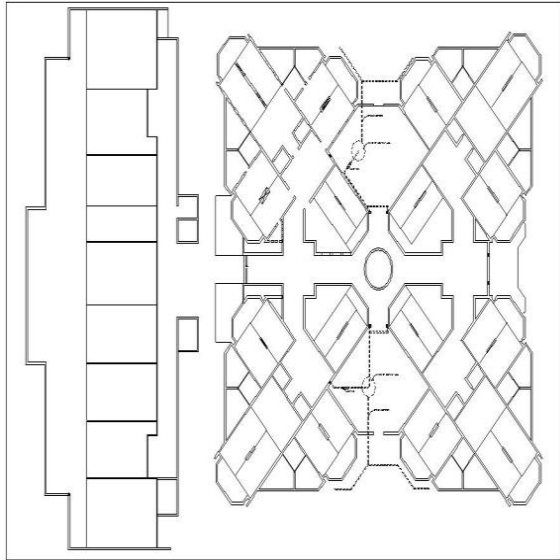


Figure 2 plan of UVPCE building

3.1 Technical data.

a) Rainfall data.

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	965
2013	980

Figure - 4 annual rainfall data of UVPCE building.

3.METHODOLOGY

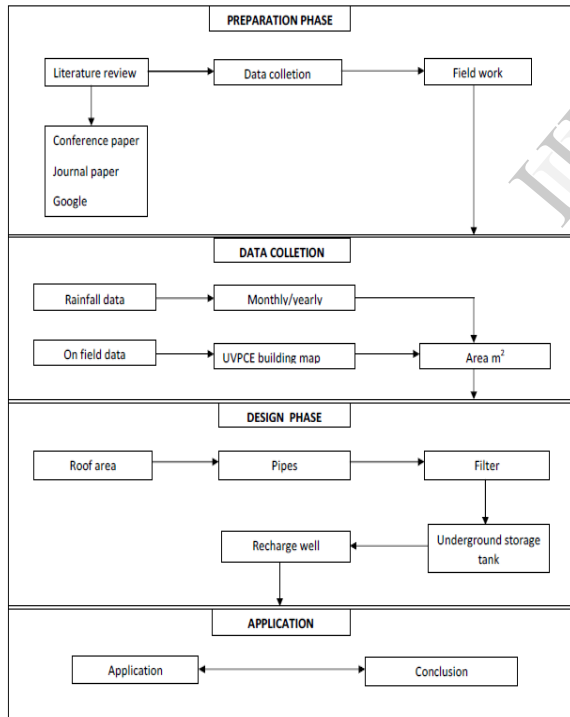


Figure - 3 Methodology

b) Intensity of rainfall.

The rainfall intensity is taken as 30 mm per hour.

c) Area of roof top.

The area of roof top UVPCE building 2700m<sup>2</sup>

d) Efficiency of the collecting system=85%

4. 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 UVPCE 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 2700 m<sup>2</sup>. The efficiency of the system is considered as 85%.

Water available from roof = 0.980 X 2700 X 0.85 = 2249.1 m<sup>3</sup>

So, the desired capacity of the storage tank is 2249 m<sup>3</sup>.

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

Here we design for 50,000 liter capacity water tank. So the 25,000 liter of 2 tanks should be provided.

### Provision of water tank Map

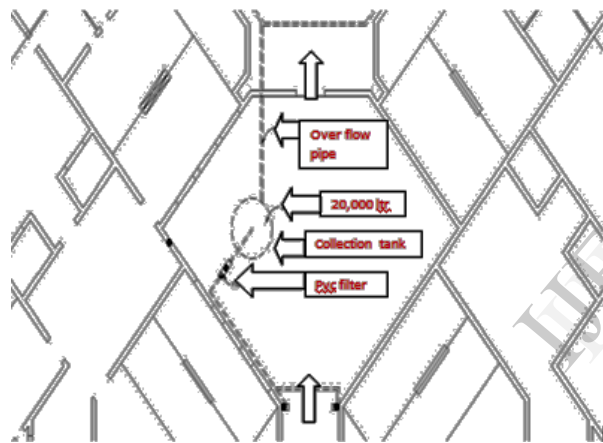


Figure 3 provision of water tank in uvpc building.

### Conclusion:

With help of data collection and analysis of UVPCE building, the roof top water harvesting is perfectly suitable for 2700 m<sup>2</sup> area. so we will collect 50,000 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 .

## 10. References

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