

RAINWATER HARVESTING IN URBAN AREAS – ISSUES, NEED AND RELEVANCE

Introduction:

Average Annual Rainfall in India is 925 mm. This rain is received mainly from two monsoons:

Southwest - During June to September. This spreads to western, northern and central India.

Northeast - From October to December. This is received mostly in South India.

India is unique in the pattern of rainfall it receives. It has the region of highest rainfall – Cherrapunji (about 12000 mm) and the region of lowest rainfall – Thar Desert (about 50 mm) in the entire world.

Rainfall in India is not uniform. It varies in space and time. The number of rainy days in a year varies from 5 days to 180 days.

The Urban Scenario:

Almost all urban areas, consisting of large and medium sized cities, face the twin problems of floods during monsoon and shortage of fresh water during non-monsoon months.

Unlike in the past, present day urbanization has resulted both in shrinking of open spaces and very minimal area remaining unpaved. This has ultimately resulted not only in flooding of cities but has also caused water scarcity due to groundwater depletion in general and saline intrusion in coastal cities.

Solutions:

Urban rainwater harvesting, due to lack of open space for capturing the runoff, is mostly in sub-soil storage as groundwater by injecting large amounts of rainwater into the soil during rains. RWH in urban areas also consists in reviving whatever water bodies that are left behind without allowing any further construction in them in future. This will be an activity at the macro level and will have to be undertaken by the government. At the micro level every resident/individual should implement both rooftop and driveway runoff harvesting in their respective homes, commercial complexes, office premises, factories etc.

RWH at the Micro Level

In every premises, whether it be a house, multi-storeyed residential and/or commercial complex, office, factory etc., rainwater falls only on two places: 1) rooftop 2) all around the builtup area, which could be a driveway, garden etc.

1. Rooftop Harvesting

Rooftop rainwater is of a good quality as it falls on clean terraces and is brought down by the drainpipes called rooftop pipes.

I) Direct at least one or more of these pipes located close to the existing below ground level masonry tank (also called sump) into it through a filter.

Filters

Filters, which are used only to remove suspended impurities in rooftop water, can be masonry tanks measuring 2.5 ft. X 2.5 ft. and about 3 ft. deep. One third of these filters should be filled with coarse river sand sandwiched between two layers of pebbles/blue metal. A nylon mesh should be spread in between the bottom layer of pebbles and sand. The remaining two thirds should be left unfilled for smooth flow of water. A PVC drum can also be used for this purpose.

Note 1: In cases of diversion of rainwater into sumps, the filter will have to be located above the ground level and there should be enough space available for it.

Note 2: Diversion to sumps is recommended only in places where there is no or very little municipal supply and where water is purchased or tanker fed even on rainy days.

II) Any overflow from the sump can be led into an open/dug well, if any, within the premises. Pipes not directed to the sump can also be led

into the well (figure.1).

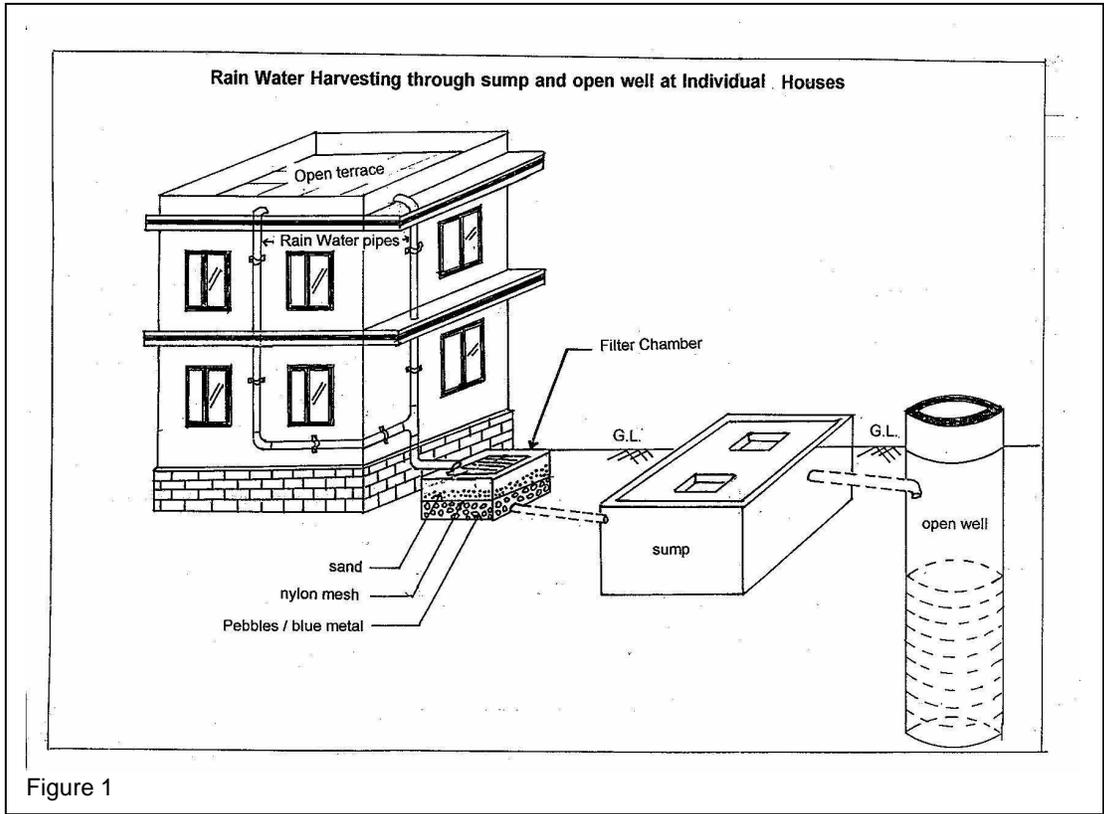


Figure 1

III) In the absence of an open well, a percolation/recharge well could be dug (figure 2) and the same can be made use of to put the rooftop water into it.

Percolation Wells

These are constructed using cement rings, the diameter of which range from 3 ft. to 6 ft. depending on the volume of water that is likely to be ingested into them. The depth to which these wells are dug depends on the nature of the soil. They are left unfilled and covered with RCC slabs of suitable thickness.

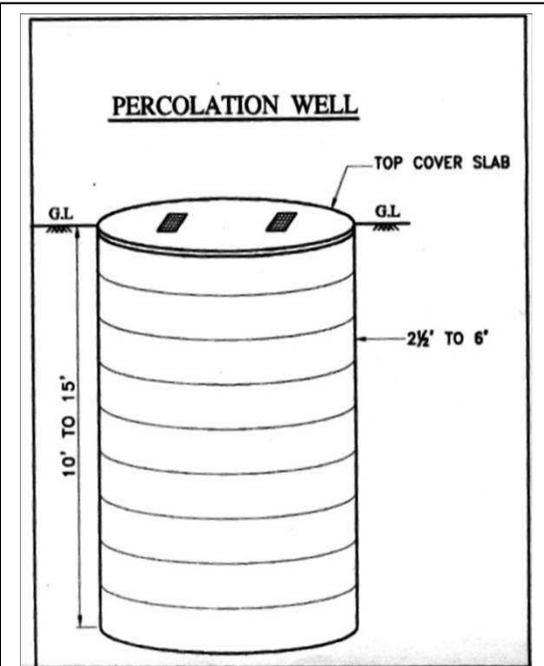


Figure 2

IV) In houses/flat complexes where there is not enough space around the built-up area to dig a recharge well, a percolation/recharge pit could be made (figure 3) for the purpose of putting rooftop water into it.

A percolation/recharge pit is a hand bore made in the soil with the help of an augur and filled up with pebbles / blue metal and river sand on top. The depth of these pits will be anywhere between 4 and 8 metres depending on the nature of the soil. The pit has to be dug to a depth till a reasonably permeable stratum is reached. The diameter of the pits will be 25 cm. (10in.). A square/circular collection chamber with silt arrestor is provided at the top. Instead of filling up with pebbles, which is done only to prevent caving in of the bore, a PVC pipe of 6 in. diameter can also be inserted for the entire depth.

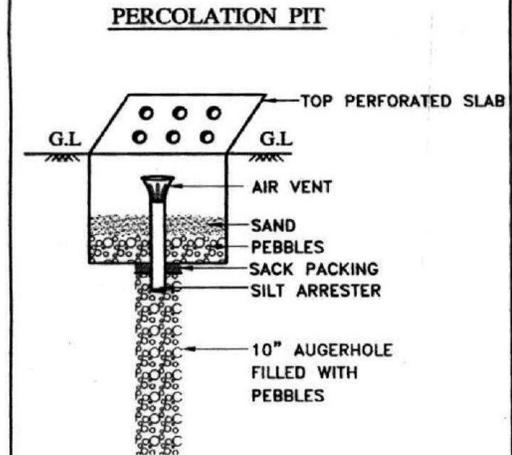


Figure 3

V) In areas where the soil is likely to be impermeable up to say, 20 ft. or more, it is advisable to go in for a percolation/recharge well up to 10 or 15 ft. and a percolation/recharge pit within this well up to another 10 or 15 ft. from its bottom till a permeable soil is reached. A PVC pipe of 4 or 6 inches' diameter is inserted into the bore for the entire length (figure 4).

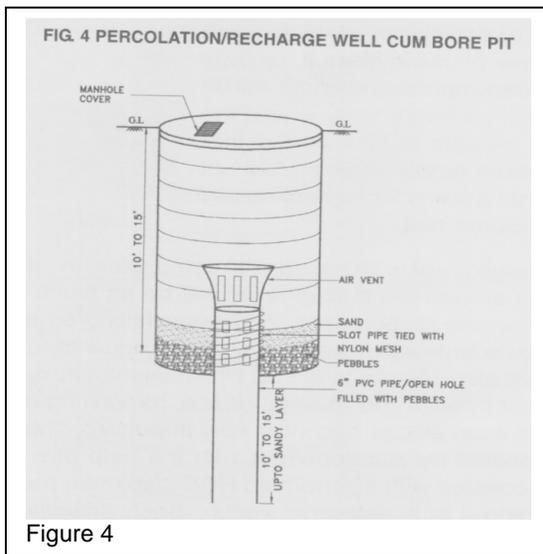


Figure 4

Note: The above mentioned alternatives pertain to the soil found in and around Chennai and suitable changes will have to be incorporated into them by taking into account the nature of soil found (up to a depth of 10 metres) in places where harvesting is attempted. It should be borne in mind that RWH, as aquifer recharge is soil specific, which will have to be reasonably permeable to take in all the water that is ingested into the RWH structures.

2. Driveway Runoff Harvesting

There is a general feeling among people that only rooftop water is fit for harvesting and not the driveway runoff. This is so because surface runoff both at the micro and macro levels appears to be dirty hence thought unfit for harvesting. It should be borne in mind that it is only suspended impurities and can still be put into recharge wells both at the micro and macro levels, where the soil will be able to filter it. It is true that surface runoff water should not be led into a sump for immediate use or to a source well.

In a large number of houses/flat complexes, office complexes the driveway area (all around the built-up area) will be as much or even more than the rooftop area. Rainwater falling on this area will be quite large and in addition a sizeable quantity of rooftop water will also contribute to this, which eventually runs off to the street through the gate(s). Hence harvesting driveway runoff in such places becomes very important. This should be harvested by intercepting it with the help of a shallow gutter (covered with a perforated RCC slab) or a bump (which will be a cheaper alternative to the gutter) near the gate(s) and directed to a recharge well(s) (figure 5). Such driveway runoff should not be led into a source well or a recharge pit since the runoff will contain large amounts of silt.

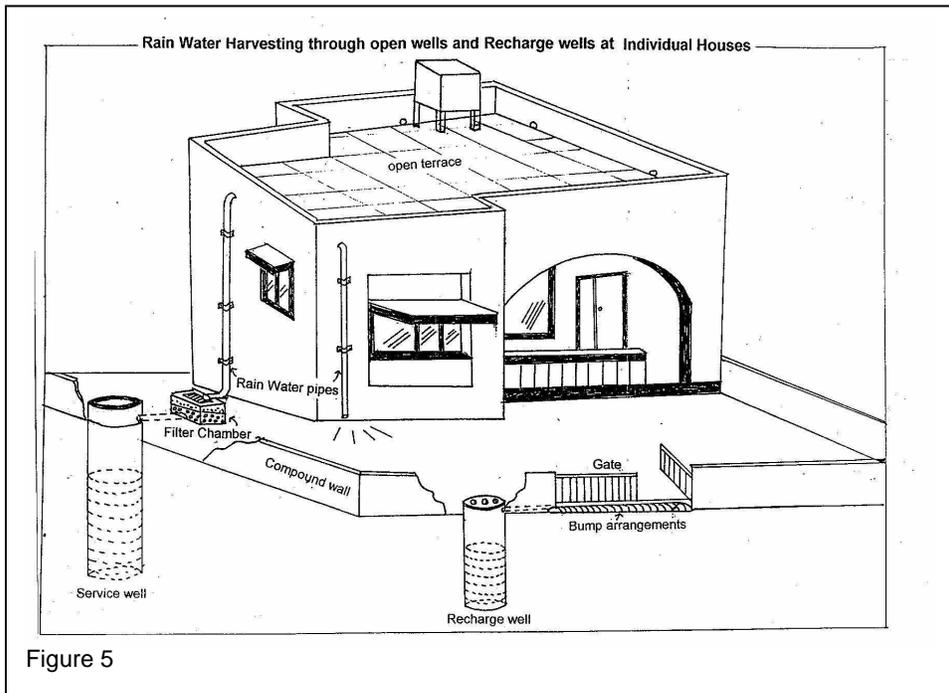


Figure 5
Please note that the figures, which have been referred to above, can be found in the booklet titled "RAINWATER HARVESTING IN URBAN AREAS" published by the Rain Centre.

Conclusion

Most metro cities in India are water starved but not rain starved. We should not forget the fact that water harvested is water produced and make sincere attempts to harvest every drop of water that falls within every premises, locality, city and country before thinking in terms of mega projects like interlinking of rivers, desalination of sea water etc. Pollution of rivers and dumping of garbage and industrial and domestic effluents into water bodies and encroachment of them will have to be stopped and the water bodies will have to be revived for capturing rainwater.

Keywords: rain, rainwater, water, urban, cities, towns, percolation, recharge, runoff, harvesting, filters, rooftop, tank,