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Water Conservation Practices in a Housing Society

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Abstract – *One of the basic human need in our day today life is water. The importance & scarcity of water growing day by day is well known to all. Many cities around the world are facing the problem of water scarcity. In this study the main focus is on conserving the water from a household (housing society). Various measures are adapted to conserve the water & a huge difference is seen in the daily fresh water demand. Waste water from each unit is taken to the sewage treatment plant. After proving the necessary treatment the water is recycled & is put up into some useful mean. The water from Rainfall is also conserved & is used in some low end uses. This have an overall impact on the use of water & reducing the fresh water demand. Further the reduced demand of fresh water is further explained with the help of graphs. This signifies that a huge amount of water can be conserved by adapting some small measures even from household, which would ultimately result in the conservation of water which can be utilized by our future generations.*

Key Words: Conservation1, Scarcity2, Demand3, Household4, Water5 etc.

1. INTRODUCTION

Water is one of the most familiar word in our day today life. It is one of the basic human need & its importance is well known to all. But besides knowing the importance of this precious resource it is continuously being wasted, polluted & as a result of which it is getting depleted. The scope of the whole work is to find out various techniques under which the efforts are made to reduce the water consumption & ultimately recharge the ground water table so that the water could be readily available for our future generation. Moreover efforts are made to ultimately reduce the fresh water demand & to recharge the ground water table as much as possible. Following are the list of various methods adapted to reduce the water demand:

a) Rain Water Harvesting & Ground Water Recharging.
b) Recycle Water Supply for Horticulture, DG cooling, Street washing & other low end uses.
c) Recycle Water Supply for the Flushing Water Demand.
d) Recycle Water Supply for the Golf Course Water Demand.
e) Installation of low flow fixtures.

1.1 OBJECTIVES

The main objectives of the study are as follows:

a) Recharging the ground water table by the rain water harvesting structures.
b) Reduction in the fresh water demand by making use of the recycle water from the sewage treatment plant as much as possible. This will reduce the total net fresh water demand of the project by more than 50 %. Thereby reducing the load on tube wells and dependency on municipal supply.
c) By making use of Recycle Water Supply form the Sewage Treatment Plant for Flushing, Horticulture, Street Washing, DG Cooling Sets, AC Cooling Towers & other low end uses etc.
d) Making use of RO reject & AC reject water in some low end uses.
e) Less water consumption by installing the low flow fixtures.
f) Water & energy conservation along with the improvement in the water management.
g) Improving the overall economy by reducing the cost of pumping etc.

1.2 RAIN WATER HARVESTING

The rain water is diverted from the rooftop using rain water pipes to the drainage network. The entire campus shall be sub divided for recharging structures. As most of the rainfall occurs in 3 monsoon months only, it is not viable to make large storage facilities for storing the rain water for direct reuse. Hence, ground water recharge is being suggested. This would help in checking the water table depletion. It has been proposed to provide desilting tanks and recharge wells for the desired purpose. The rain water will be diverted into the desilting tank to remove inorganic impurities and the outflow of the desilting tank will be taken into the recharge well.

A. DESILTING TANK

The desilting tanks are used to remove silt and other floating impurities from rain water. Desilting tank is like an ordinary container having provision for the inflow, outflow and overflow along with baffle walls. Apart from removing silt it holds the excess amount of water till it is soaked up by the recharge structure. The bottom of tank will have unpaved surface (layers of coarse sand) to allow standing water to

percolate into the soil. The rain water collected in these desilting chambers may be utilized for horticulture purpose.

B. RECHARGE WELL

The recharge well consists of 250-300 mm dia. bore holes in the middle of the pit. 160 mm dia. perforated UPVC pipe will be lowered in the middle of the boreholes and the pit will be filled with gravel / pebbles in three layers of 500 mm each consists of boulders, gravel & coarse sand. This system is proposed to sustain ground water table by recharging the earth. The mouth of the UPVC pipe shall be protected to avoid silt getting into the same.

1.3 BETTER IRRIGATION PRACTICES

A separate network of pipes would be laid in the soft landscape area for watering the grass and plants. Landscape irrigation would be done by a separate set of pumps, which would draw water from the treated water effluent tank of STP.

2. METHODOLOGY

2.1 STUDY AREA & PROJECT DETAILS

The project comes under the recreational green category & is proposed to be constructed over a total plot area of about 100 acres. The project has been sub divided into 2 parts comprising of Low Rise (Villas) & High Rise (Towers). The total plot has been divided into Eight Phases / Parts of development. The total plot area has been divided into eight phases / clusters wherein each phase is proposed to have its own independent services. These 8 phases consists of villas, low rise towers (S+7) having apartments & high rise towers (S+19 & S+36) having apartments. The conceptual plan is dynamic, sustainable & conductive to phased development with diverse community. The important element of it would be clear environment, ecological balance, healthy atmosphere, comfortable living for all the residents of various ages & economic group with added value of visual comfort. The population is being forecasted in that particular group housing. The various sources of water supply has also been discussed here. The comparison of total fresh water demand & water demand after reuse & conservation of water has also been made.

2.2 SOURCE OF WATER SUPPLY

Municipal water supply is available as the prime source of water. So, it has been recommended to use municipal water augmented with Ground Water for water supply to the scheme, with necessary treatment as required as per water test report. Ground Water shall only be used only if supply from Municipal source is lesser than the actual Fresh water requirement. The Municipal water line will be laid from external road to the underground water tank.

2.3 POPULATION DETAILS

Total Apartments in Cluster – A = 368
Total Apartments in Cluster – B = 660
Total Apartments in Cluster – C = 114
Total Apartments in Cluster – D = 114

Total no. of Apartments = 1256

Total 100 sq. yds. Villas = 245
Total 125 sq. yds. Villas = 211
Total 150 sq. yds. Villas = 117
Total 180 sq. yds. Villas = 111
Total 220 sq. yds. Villas = 70
Total 300 sq. yds. Villas = 29
Total 500 sq. yds. Villas = 13
Total 1000 sq. yds. Villas = 9

Total no. of Villas = 805

Table -1: Total Water Requirement Calculation

Description	Total Population (Persons)	Unit Water Consumption (lpcd)	Total Water Requirement (liters)
Apartments	5652	135	763020
Villas	4723	200	944600
Club	1560	15	23400
Commercial	200	45	9000
Staff	520	45	23400
Makeup Water for Swimming Pool			35000
Filter Backwash			20000
Horticulture			973000
Golf Course			184800
Green Area within Villas			157500
TOTAL	**12135**		**31,33,720**

Hence, the Total Permanent Population = 12135 persons
Total Water Requirement = 3133720 liters

The total water requirement for the entire housing society is found to be in a huge quantity. To reduce the total fresh water requirement & net water requirement it is proposed to use the recycle water from the sewage treatment plant for flushing, horticulture, street washing, DG Cooling & other

low end uses. Recycle of treated effluent into flushing and horticulture will reduce the total net fresh water demand of the project by more than 50 %. Thereby reducing the load on tube wells and dependency on municipal supply. Hence, a recalculation is done as per NBC – 2016 regarding the water requirements from both fresh & recycle water from STP. The calculation for the same is shown is table number 2.

Table -2: Water Requirement Calculation (Fresh & Recycle)

Description	Total Population	Domestic Water Requirement		Recycle Water Requirement	
	(Persons)	(LPCD)	(LPD)	(LPCD)	(LPD)
Apartments	5652	90	508680	45	254340
Villas	4723	200	944600		
Club	1560	10	15600	5	7800
Commercial	200	30	6000	15	3000
Staff	520	30	15600	15	7800
Makeup Water for Swimming Pool			35000		
Filter Backwash			20000		
Horticulture					973000
Golf Course					184800
Green Area within Villas					157500
TOTAL	**12135**		**15,45,480**		**15,88,240**

2.4 TOTAL WATER REQUIREMENT OF THE PROJECT

The estimated water requirement of the project shall be as follows:

Total Permanent Population = 12135 persons
Total Water Requirement = 3133720 liters
Total Domestic Water Requirement = 1545480 liters
Total Recycle water Requirement = 1588240 liters

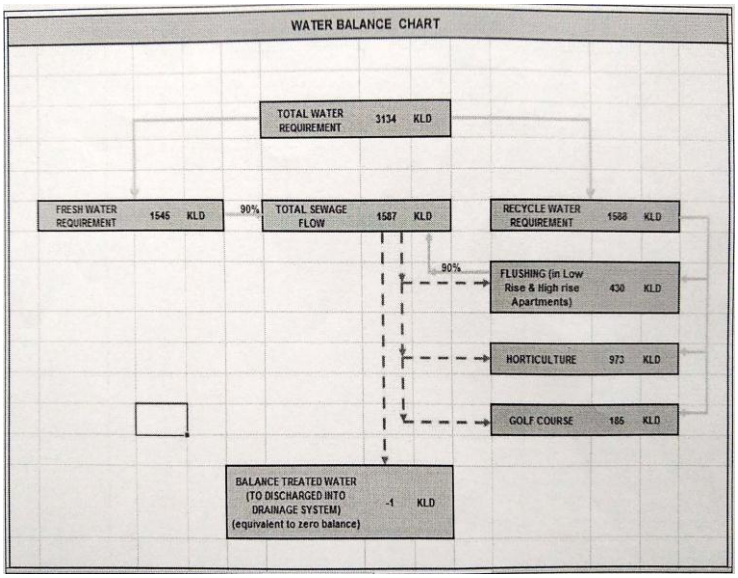

Fig -1: Water Balance Chart

From the above figure, it is shown that the balance treated water to be discharged into the drainage system is equivalent to zero discharge. Hence, by using the recycle water for the various purposes mentioned above it is clear that the zero liquid discharge is there for the housing society. This ultimately leads to the no discharge in the drainage system, reducing the dependency on the municipal & tube well source of water supply for the fresh water.

2.5 NUMBER OF RAIN WATER HARVESTING PITS & SIZE

The rain water from the building will be taken to the desilting tank through a network of pipes. In the desilting tank the inorganic impurities will be removed & the water will be further carried to the recharge pit. In the recharge pit the water will be taken too deep beneath the ground through the bore holes & pipes to recharge the ground water table. The details of total catchment area & the discharge is listed below:

Total Catchment Area = 403575 Sq.M
Total Discharge = 2526.80 KLD

Desilting Chamber:

The purpose of desilting tank is to remove all the floating impurities from the water. It has an inflow & an outflow. It can also hold good amount of water within itself. The water standing in the desilting tank may be used of horticulture purposes if needed. Hence, irrigation near the RWH structure can be done easily. Its bottom surface is of impervious layers so it can hold water very easily & effectively. The size & depth of the desilting tank is shown below:

Length = 2.5 meter

Width = 2.0 meter
Depth = 2.1 meter
Capacity of 1 Desilting Chamber = 10.5 Cu.M

Recharge Pit:

Diameter = 2.50 meter
Depth = 2.50 meter
Capacity of 1 Recharge Pit = 12.3 Cu.M

Total volume of one RWH Structure = 22.77 Cu.M

So, Number of RWH Pits Required = 111

Hence, a total of 111 number of rain water harvesting pits are proposed to be constructed at the entire site. This would help in recharging the ground water. So, there would have been a check to the ground water table by these recharging structures. Till date as we are dependent on the extraction of ground water by the boring technique known to us, this would have been must to recharge the ground water table by constructing the rain water harvesting structures.

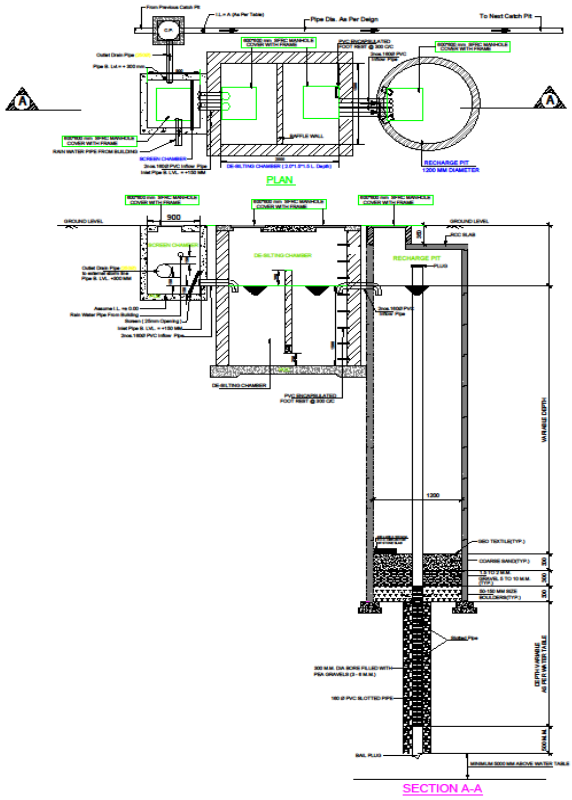

Fig -2: Rain Water Harvesting Structure

3. RESULT & CONCLUSIONS

Hence, from the above study it is shown that even from a housing society we can save ample amount of water by just making use of the recycle water from the sewage treatment plant in flushing, irrigation, street washing, DG cooling & other low end uses where ever possible. Apart from this the following conclusions have been made as listed below:

a) Reduction in fresh water demand by making use of recycle water in flushing.
b) Reduction in fresh water demand by making use of recycle water in irrigation.
c) Reduction in fresh water demand by full filling the Golf Course water demand by making use of recycle water.
d) Recharging the ground water table by constructing the rain water harvesting structures.
e) Reducing the dependency & load on municipal water supply.
f) Reducing the cost for pumping as the dependency on tube well water supply is reduced to a greater extent.
g) Water & energy conservation along with the improvement in the water management.
h) Making the water available for the future generations for a longer duration by lesser use of water & by recharging the ground water table.
i) RO reject & AC reject water can also be used upto some extent.

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