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Proposed Rural Water Supply and Sanitation System for Nedungundram Village

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Abstract: *Water is important and precious as it fulfils the basic necessity of life. It is necessary that the water used must be good and free from unwanted impurities or harmful toxic chemical compounds or bacteria More than 80 % of Indian population lives in rural areas, but only few of them have some form of potable water supply. It hasn't be feasible to cover all villages with piped water supply because of various constraints such as Scattered and inaccessible nature of villages, Non- availability of nearby water sources.*

Hence, this project focuses on a selected rural area to plan a suitable water supply scheme in accordance with their demands and requirements. The provision of such a scheme shall ensure a constant supply of safe wholesome water to the people for drinking and household purposes so as to keep diseases away and thereby promoting better health. The project also covered planning of facilities to maintain better sanitation and beautification of surroundings. Besides promoting overall hygiene and public health standards, it also ensures reduction in environmental pollution.

Keywords*: toxic compounds, sanitation, public health standards.*

I. INTRODUCTION

1.1. Water Supply

Water is essential for our survival. It is important to remember that water is not a permanent resource available throughout the year. However, it can be recycled. Today, overhead or underground tanks store water in our homes in cities. However in ancient India, many traditional practices existed to harvest or collect water from rain, streams and rivers.

A water harvesting system is one that collects and stores water for later use, especially in summer, when water is scarce. India's use of traditional water systems dates back 7,000 years and also they knew the importance of water harvesting.

1.2. Sanitation

The waste products of a society including the human excreta had been collected, carried and disposed of manually to a safe point of disposal by the sweepers since time immemorial. This Old Conservancy System of sanitation has now been replaced by Modern Water Carried System in which the wastes are mixed with sufficient quantity of water and carried through closed conduits under conditions of gravity flow.

In developing countries like India, this system is been established in all communities but still many rural areas are not equipped with these facilities since the municipal sewer connection lines are not extended to villages Improperly managing latrines and night soil causes pungent smells which may continue to pollute the surroundings. Hence a minimum provision for sanitation facility in rural areas is necessary to overcome health hazards and environmental pollution.

II. OBJECTIVE

- To gain a practical knowledge about the selection of source, supply of good quality water & its effective maintenance.
- To study the sanitation facilities available and emerge new ways to maintain sanitation for development of hygienic area.

Development of the Nation is not only based on the infrastructure development, but also the water supply and sanitation facilities. In addition to these the proposal includes;

i. Individual Toilets for every house are planned and designed.
ii. Sewage to be disposed on farm crops by proper channelling is planned.

iii. Organic Solid waste is made use for energy production and excess water is diverted to farm crops.

III. METHODOLOGY

- Preliminary study on various villages and to investigate about water supply and sanitation problems existing in those areas.
- Selection of a suitable rural area for the study of available water supply and sanitation facilities.
- Complete study of the existing water supply facilities in the area and the water demand is to be analysed.
- The additional requirements necessary to fulfill the needs of people are to be assessed.
- Planning of a suitable water supply scheme, in order to satisfy the additional water demand existing in that area.
- Complete study on existing sanitation facilities in the area and to identify problems associated with sanitation.
- Planning of suitable sanitation scheme in the area so as to provide a better living standard in terms of public health and also environmental protection.

3.1. Case Study Area

Village : Nedungundram
Taluk : Chengalpattu
Union : Kattangulathur
District : Kancheepuram
State : Tamil Nadu

FIGURE 1-TOPOGRAPHIC MAP OF NEDUNGUNDRAM

3.2. Existing Water Supply Facilities

Since there are no water bodies such as river or stream nearby the area, Groundwater is the main source of potable water. Since, Groundwater has a better quality and required no treatment except chlorination for disinfection it is used at least economy. Bore wells are dug and water is pumped to Overhead tank. The stored water is supplied based on requirement and timing. Open wells are also built as additional purpose. Hand pumps are installed at various locations in case of insufficiency.

FIGURE 2 - OVERHEAD TANK

3.3. Estimation of Water Demand

3.3.1. Estimation of Maximum Daily Draft

Average annual daily draft,

= (80*2841)

= 227280 *l/d*

Maximum daily draft,

= $\frac{180}{100}$ * 227280

= 409,104 *l/d*

Existing:

60,000 l Tank (2 Nos) = 120,000 *l/d*

30,000 l Tank (2 Nos) = 60,000 *l/d*

Total = 180,000 *l/d*

3.3.2. Additional Requirement

Need = Demand – Supply

(409,104 - 180,000) = 229,104 l/d

If three Overhead Water tanks of 40,000l capacity are constructed, it could compensate 120,000 l/d.

The rest of the demand could be overcome by existing,

Open Wells (3 Nos)

Mini Tank (1000 l) (5 Nos)

Surface Water (Lake)

- Individual bores at houses
- Street taps

3.3.3. Provision

Three Overhead Tanks are to be provided to meet out the additional requirement, with 40,000l capacity each.

IV. RESULTS AND DISCUSSIONS

4.1 Tests on Water

SL.NO	PARAMETER	VALUE	ACCEPTANCE
1	Ph	7.1	Yes
2	Turbidity NTU	66.4	Yes
3	Hardness (ppm)	263	Yes
4	Total Dissolved Solids (mg/l)	5	Yes

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4.2. Purification Suggested

4.2.1. Sedimentation

The water is allowed to stand undisturbed for atleast 6 hours for particles of size 0.05mm to settle down.

Settling period, $t_s = \frac{\text{depth}}{\text{settling velocity } (v_s)} = \frac{3}{1.4 \times 10^{-4}} \sim 6$ hours

4.2.2. Disinfection by chlorination

Since, all the parameters tested satisfy the acceptable range of potable water given by Indian Standard, a minimum treatment of disinfection is enough.

Disinfection is done by Chlorination by two ways:

- Using Chlorine Tablets (Halogen Tablets) (0.5g/20l of water). These halogen tablets are released from National Environmental Research Institute, Nagpur and available in all Indian Markets at cheap rate.
- Using Bleaching powder that contains 30-35% of chlorine. 1 kg contains 30% strength. When 1kg is added to 1ml it gives 0.3mg/l chlorine which is the dosage limit as per Indian Standard. Hence, it can be dosed 5mg/l with 30 minutes contact period.

4.3. Existing Sanitation Facility

Since there is no proper development of the rural area, people uses open space to excrete. Also there are no toilet facilities provided by the government except for few residents. Few years ago pan and trap arrangement with underground leaching pit was provided for all houses but it has now been extinct because of inefficiency.

Also there are no proper adoption of sewage and solid waste disposal and they are let it streets in slum areas that lead to breeding of insects.

4.4. Additional Provision

- Individual Toilets for every house are planned and designed.
- Sewage to be disposed on farm crops by proper channelling is planned.
- Organic Solid waste is made use for energy production and excess water is diverted to farm crops.

Considerations

- Water needed for anal cleansing per use per member of the family is $1\frac{1}{2}$ litres
- The latrine is used for excretion twice a day by each family member
- Water needed for flushing after every use is 2 litres
- Water needed for flushing when only urine is passed is 1 litre per member per day
- Average urine + excreta production per day per members is $1\frac{1}{2}$ litres
- The water table remains 2 m or more below G.L throughout the year (Dry Pit)
- The local soil is sandy loam or loam
- The pits have been designed for 2 years capacity
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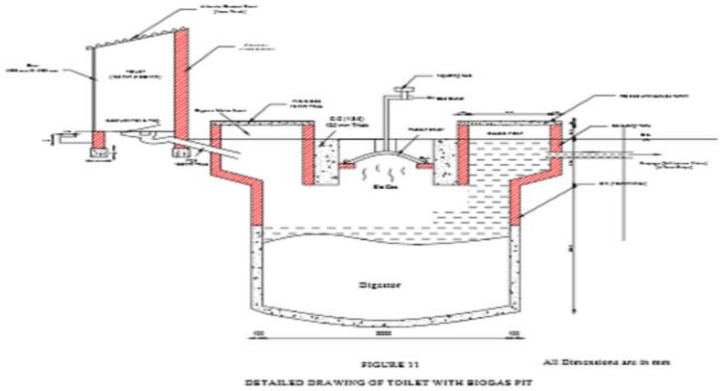

FIGURE 3- BIOGAS PIT

4.5. Education for Awareness

All potable water should be disinfected to avoid water borne diseases such as typhoid, cholera, bacillary dysentery (bacterial infections) and infectious hepatitis, polio myclitis (viral infections) by "Public Water Supply Standards" and "Environment Hygiene committee"

It is, therefore, very essential that the people are educated in using and properly maintaining the latrines. Every household getting the latrine should keep (a) a brush having a long handle for cleaning the pan, (b) a can of 2 litre capacity for flushing, and (c) a set of instructions for proper use and maintenance of the latrine. Since in rural areas, the households do not have tap connection and even where there is a connection, the supply is only for a few hours, a small container, say of 25 litre capacities, to store water for ablution and flushing may also be kept outside the latrine. This container may be filled in daily.

It will ensure easy availability of water for latrine use and flushing. Similarly, a container of about 100 litres capacity may be provided in the institution.

V. CONCLUSION

Development of the Nation is not only based on the infrastructure development, but also the water supply and sanitation facilities. In this project the following conclusion has been obtained.

- The water supply and sanitation scheme has been studied in the selected rural area.
- Bore wells were the ultimate source of potable water in that particular area and overhead water tanks were designed as per Indian Standards, to meet the additional requirement of water demand calculated as per BIS.
- The Quality of water was also assessed to ensure the safety of public health.
- To meet the scarcity of water in Non-Monsoon seasons "Rain Water Harvesting Technique" was suggested in that village for conserving water
- Based on the direct observation of the village, it is been found that individual toilets are available for only few of the residents, while most of the people are excreting in open spaces.
- Thus, Sanitation facilities such as Sewage Management, Solid waste Management and Toilets were designed to be provided. Also ideas to motivate them to efficiently use the toilets instead of contaminating the surroundings were suggested.
- The Bio-Gas pit was designed for the effective utilization of waste and for the purpose of Energy production which generates bio gas from organic waste, latrine & night soil which can be used as Cooking Gas, Fuel for Bio lamps etc.
- Moreover the growth of a village depends upon the people understanding their nation Trends. "Save Water and Save Energy". Thus need for educational awareness about energy conservation among public were suggested.
- Illiteration is the main reason for the absence of Hygienic Environment. Hence some of the Health concerning awareness was finally proposed.

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