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Design and Laying of Sewerage System in Wagholi(Ward No. 5&6), Pune

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Abstract - *Wagholi is a village located in the Pune district (altitude:-18.5793^{0}N & longitude:- 73.9823^0 E). This present project is to be undertaken to design an efficient sewerage system for Wagholi village area. In this regard, as part of the project, assessment of the present conditions of the sewerage and sanitation system is conducted by surveying the nearby areas. Survey of the houses in the area is conducted with the help of a detailed questionnaire prepared as part of the project. Surveying of the area is performed and map of the area showing the land contours is prepared. The contour map is used to select and design the gradient and slope of the area for the purpose of laying sewer lines. Hydraulic analysis is also conducted for designing storm drain system. The sewer lines are aligned to ensure economic transport of sewerage to the treatment plant. Sewer pipe materials are selected along with fittings and joints for the sewerage system were selected. Sewer appurtenances are also selected for the final design.*

Key Words: **Sewerage system, wagholi, sewers, survey, sanitation, waste water.**

1. INTRODUCTION

The progress and prosperity of the India depends entirely on the development of social and economic life of rural area. In India, the smartness concept is not even thought about the rural areas. Smart village concept based on sustainable parameters like water, waste water, energy, small scale industries, transportation system, health, connectivity and digitization, trade centres, education, agriculture and irrigation. The present work mainly focused on sewage water parameter and waste water related issues faced by the rural community.

The sewage treatment is a process that excludes the contaminants from the wastewater effectively and make it clean. The basic purposes behind construction of sewage treatment plant are viz., prevention of pollution of natural stream water and thereby protecting the environment, and increases water resources at village level for various secondary purposes. The construction of sewage treatment village level helps in simplifying water scarcity issues in villages.

It is absolutely necessary to study of sewerage system to upgrade the status of sanitation of small towns from the consideration of health ground. From this work the society as well as the Government will be beneficial.

The two principal reasons for this are that it can be cheaper than on site sanitation systems, and that it is often institutionally easier that is water and sewerage authorities accept it more readily than on site systems simply because it is a sewerage system and therefore, automatically part of their mindset.

1.1 Problem Statement

In Wagholi village, there is no proper system developed for disposal of sewage and solid waste. The waste water is directly flowing on the roads due to which stagnation of waste water is occurring. Stagnation of waste water causes infiltration which contaminates the underground soil. This situation is causing environmental and health issues. Hence, we are likely to consider this problem as our project and definitely finded solution to this.

1.2 Objective

i. Data collection of Wagholi village- outlets, existing system if any, disposal point
ii. Design of sewerage system manually and compare it with software.
iii. Estimation of the system.

1.3 Scope of the work

The sewerage system will be designed for Wagholi village depending upon the data collected using questionaries' survey & Grampanchayat records.

This system will be designed for next 20 years considering future growth of the village.

2. PREVIOUS RESEARCH WORK

1. Methodology of planning domestic sewage system in slums & rural areas by economic way (Journal of Engineering Sciences, Assiut University, Vol. 37, No. 5, pp. 1049-1062, September 2009) :
Slums and rural areas became one of the most serious problems which face Egyptian society whereas 75 % from Egypt' population live in Egyptian countryside, and 20% in slums (human development report), less than 5% only from Egyptian countryside with sanitary sewage service (CAPMAS). The problem has economic, physical, strategic, social and environmental dimensions, legislations and laws. The paper aims to provide immediate flexible system' suggestion to adhere to those dimensions. It took successful international and local experiments related to the problem. It took a village as case study; it took samples from desludging truck in the village and analyzed it. Analyzing results and comparing it with the results of analyzing at the influent of traditional WWTP (ZENIN). The study ended into proposing Simi non-pipe system which consisting of main collector to receive discharge from trucks as an immediate stage and then treatment plant working with anaerobic system (UASB/USBR) it will followed by aerobic-system later and final disposal dumping into drain.

2. Design of Underground Drainage for Anklav Town, Rushikumar R Prajapati, Neha M Joshipura, Bhavin Patel : Since last decade Infrastructure development has been taken place all over Gujarat because of this migration of people from villages to town are also increase and reach up to 50% of world population leaving in Towns. It also predicted that about 70 % of world population will be leaving in cities by 2050. So development of the town occurs at very faster rate. Thestudy guideline for majority of towns for implementation of underground drainage projects. Key words: Pumping Station, Collecting Network, Manholes.

3.Design and mapping of underground sewerage network using GIS : The infrastructure of a city, mainly the water supply and sewerage system are vital for urbanization, wastewater generated from urban area is a result of domestic and industrial activities, and domestic wastewater contains organic and inorganic matter in suspended, colloidal and dissolved form. The municipal wastewater management is a critical issue in an urban environment. If the municipal wastewater is not properly collected, treated and disposed, the related effects pose serious threat to the environment. Many small cities do not have proper drainage system, Islampur, Dist. Sangli; Maharashtra, India is one such. As on date all the domestic waste water is either send in open drain or in open area around the houses. This is resulting in hygienic problems and to cater for; Municipal Corporation of Islampur town has come up with underground sewage collection plan. This study aim at designing collection system for Islampur town, the work undertaken uses, GIS as a tool for mapping the collection system (primary and secondary) in order to facilitate further works.

4.Mapping and Management of Sewerage System Amol Dilip Adhave : The Sewerage system is an essential part of living in a city or urban area, as it reduces sanitary water by carrying it away. The sanitary water makes its way through sewerage systems, into rivers and into the sewer treatment plans. In areas with houses, shops and roads we need to create alternative ways for this water to drain away into open sewer close sewer lines. For this reason, local municipal corporations provide drainage system that safely carries storm water and sewer away from built-up. Sewerage system is an important utility of urban area and in traditional way municipal corporations keeps information about them in a database like spreadsheets, hardcopy records like map. However, tabular data refers to an address is insufficient to find network lines. These type of data is hard to maintain and hard to update. So this paper gives different ways to organize asset using GIS, Google API, Tools and sensors.

3. METHODOLOGY

In this project following methods are used as,

1. Selection of the town

The factors are population, population density, area, road length, existing water supply available, type of the treatment to be provided, sub soil condition, topography of the town (geometric condition), type of population in town, average annual rainfall, present management of the town etc. will be considered for selection of the town.

2. Collection of data

A) Preliminary data:-

- Demographic data
  - i. Population details – current and projected for next 20 years
  - ii. No of households – census data
  - iii. Floating Population
  - iv. The village boundary map
- Geographical data
  - i. Rain fall data
  - ii. Water bodies
  - iii. Geology and soil conditions
- Existing infrastructure data
  - i. Roads network
  - ii. Water supply data (Municipal & Private)

iii. Existing Strom Water Drain details

- Existing underground drainage data
  i. Existing layout and zoning pattern
  ii. Sewerage and sanitation service levels
  iii. Operation and maintenance details for Sewage department

B) Secondary Data:-

- Operation of bore wells by municipality as well as the private source
- Potentiality of the development of the village
- Problems regarding point of overflow and its timing
- Manhole locations and its status
- Contour Maps

3. Analysis of data

4. Design of system

A). Layout :
To avoid deep excavation, long trunk pipes to interceptors and large pumping station, serious consideration is given to splitting the network in to two or more separate smaller systems although network layout is also an important part of conventional design, the optimization of pipe length and networks subdivision takes on even greater importance in simplified system.

B) Design Period:
The planning for Sewerage System of Wagholi village is being prepared for the year 2041 (20 Years) as the ultimate planning year(CPHEEO Manual Sr. No. 3.2 Page 3-1).

C) Flow Assumption:
As intended by the Local body, it is assumed that the Municipality will find ways and means to supply water to the town at a uniform rate of 150 LPCD in all command areas. The rate of sewage generation is usually taken as 80-90% of the water supply. The water table in this area is at depth of 10 to 15 m from G.L. Hence infiltration is not required to be considered. The estimated peak flow adopted for hydraulic design depends upon contributory population. (CPHEEO Manual Sr. No. 3.5 Page 3-3)

D) Depth of Flow:
It is necessary to size the sewer to have adequate capacity for the peak flow to be achieved at the end of design period, so as to avoid steeper gradients and deeper excavations. For the ultimate design period, the sewers are designed flowing 80% full (d/D = 0.8). (CPHEEO Manual Sr. No. 3.15.5 Page 3-28).

E) Velocity of Flow:
The flow in sewers varies widely from hour to hour and also seasonally, but for purpose of hydraulic design estimated peak flow is adopted. However it is to be ensured that a minimum velocity is maintained in the sewers even during minimum flow conditions. At the same time the velocity should not be excessive to cause erosion. For design of sewer minimum velocity should be 0.6 m/sec. To avoid erosion in the sewer network, velocity more than 3.0 m/sec will not be allowed. (CPHEEO Manual Sr. No. 3.15.1 Page 3-26).

F) Minimum Depth of Cover: The starting manhole depth of the proposed sewers ranges from 1 M to 1.5 M depending upon the topography and details of road planning network available. The Minimum Depth of Cover depends on the depth of the starting manhole and subsequent ground level of the road along the sewer. The minimum depth of cover of 1.0 M is provided.

G). Selection Pipe Material: Over the years almost all types of pipe materials have been tried and tested for sewerage application. Though there are numerous factors to be considered in designing a Sewerage System, mainly three basic factors influence the ideal choice of pipe material. 1) Hydraulic and structural design. 2) Nature of the effluent to be carried and the soil / ground water condition. 3) Ability to encounter sewage related corrosion and abrasion.

H). Manholes:
Man holes form one of the essential structures in any Sewerage System. They are generally provided at every road junction, at every change of alignment or gradient of sewers at every junction of two or more sewers at head of all sewers or branches, wherever there is a change in size of sewer and at regular intervals in the Sewerage System. They are used for inspection, cleaning and repairing of sewers and other maintenance operations.

I). House Connection & Chamber:
Necessary provision for house connection with chambers & 100 mm dia Stone ware pipe is made in the project. The one chamber will be provided between two houses.

5. Laying of sewerage system

6. Estimation

5. CONCLUSION

After reviewing all the prior researches, we can conclude that the design of sewerage system is most important part of work for the overall development of the village.

Sewerage system and laying is done successfully for wagholi village which helps in proper disposal of waste water from all

the sources which helps in minimizing the health problems relate to waste water and its advese effects on environment.

The efficient and effective design and laying of sewerage system helps to protct environment and increase the living standard of the people.

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