International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 07 | July 2021 www.irjet.net p-ISSN: 2395-0072

# DESIGN OF UNDERGROUND DRAINAGE(UGD) SYSTEM FOR CHAMANAHALLI, BANNUR

**Anjali B J[1], Shreya Sampath[2], Vinayaka M[3], Sumanth babu B[4], Parinitha.T. Niranjan[5]**

***[1,2,3,4]B.E. Students, Department of Environmental Engineering, JSS Science and Technology University, Mysuru.*
**[5]Assistant professor, Department of Environmental Engineering, JSS Science and Technology University, Mysuru.*

---

**Abstract -** *Sewerage networks are a vital part of the infrastructure of any society. In Earlier days, manual design of conveyance systems was practiced and now it has switched to advanced design practices adopting well organized computer aided design tools. Within the proposed paper the design of Underground drainage system is done for Chamanahalli, Bannur. In order to maintain hygiene conditions in the area, the study involving designing of a sewerage network with the help of SEWER 3.0 software is being proposed.*

***Key Words*** Underground drainage(UGD), SEWER Version 3.0, Town municipal corporation(TMC), Pipe diameter, Hygiene.

## 1.INTRODUCTION

### 1.1 General

A sewerage system consists of varied mains terminating at the junction of an outsized sewer line. The sewer main also terminates at the outfall. Thus, a sewerage system is often viewed as a group of sewer lines collecting into another set of sewer lines. A sewerage network is just a reverse connection of a water supply system. The cost of laying a sewerage system is appreciably high compared to the water supply system. Considering this, many research works are being done to design a cost effective sewerage network. Sewerage network which is a vital part of the infrastructure of any society. Sewerage system provides the transport facility for sanitary waste to sewage treatment plants. It conveys wastewater employed by individuals, commercial and industrial establishments to wastewater treatment facilities, ultimately to be returned to the natural environment. Within the proposed paper, 'SEWER 3.0' software is all adopted for the planning and analysis of the Underground system. This software uses manning's equation for the design of a sanitary sewer system. It is suitable for the heuristic design of small bore sewers as well as large diameter sewers and can handle up to 800 pipes. The program also gives the cost abstract for the designed sewer system. In the heuristic methodology the constraints are less. The initial data was gathered from Bannur Town municipal corporation. The look attributes considered were- pipe diameter, self-cleansing velocity, slopes and depth of excavation. By considering all the above parameters, an underground system was designed.

### 1.2 Need for proposed work:

The population of Chamanahalli as per 2011 census is 3314 and the present population is about 3900.Chamanahalli is one of the areas of Bannur town for which the underground drainage system has to be carried out to maintain good hygiene conditions. The residents have connected the sewage from households to soak pits and in some cases left directly into storm water drains and thereby leading to unhygienic conditions.

### 1.3 Background:

Bannur town is located on Mysore- Malavalli highway road and Just 25 KM away from Historical city Mysore. The main occupation of the town is Agriculture. The town has an annual rainfall of 830mm. Bannuru TMC has an area of 6.307 sq. Km & has 23 Wards. The proposed study area is Chamanahalli, a village which comes under ward 21, 22 and 23. Chamanahalli is surrounded by Malavalli Taluk towards East, Srirangapatna Taluk towards west, Yelandur Taluk towards South and Mysore Taluk towards west. The water supply to the town at present is being supplied from River Cauvery as source.

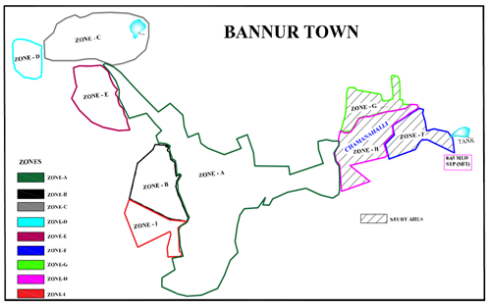


Figure 1. Map of Bannur town.

## 2. METHODOLOGY

This part provides information on the materials and methods adopted to design underground drainage systems. The main focus is to find the pipe diameter and earth excavation.

### 2.1 SEWER Version 3.0

SEWER Version 3.0 (herein referred as SEWER) is an enhanced version of the earlier program SEWER Version 2.0 developed and distributed under the joint efforts of UNDP/World Bank. The various enhancements made in SEWER have resulted in an entirely rewritten computer code.

SEWER could be used for the design and simulation of new or partially and/or fully existing gravity as well as pumped sanitary sewer systems. SEWER has been programmed in Microsoft QuickBasic 4.5, unlike the BASIC language used in SEWER. Simulation of the network means computation of pipe velocities and partial depths of flow in the pipes for different design flows.

This option is useful to test the designed network for hydraulics in the intermediate period i.e. till the design flows are established. To simulate the network for different (new) flows, choose the Design Network option from the Main Menu. After the design is done, you will be shown the Display Menu.

Choose the option of Simulate (New Flows) and you will be prompted to input the attenuation factor for design flows between 0 to 1. The fraction you enter, will be multiplied with the present flows and the network will be solved for partial depths of flow and velocities and Simulate Menu will appear.

To view the results on the screen you can use the Simulate menu. If you want to save the results, you must remember that the results can only be appended to the output file. In other words, it is a necessary condition that the user has created (saved) the output file before appending the results of simulation. You can use the Simulate (New Flows) option many times for different attenuation factors if you so wish and append the results to the same output file.

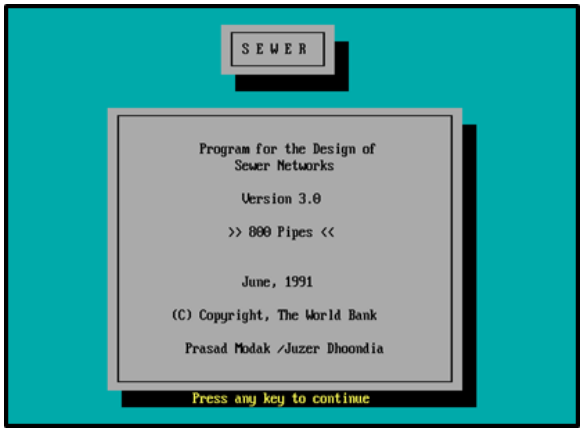


Figure 2. Sewer Version 3.0 software.

### 2.2 Design criteria:

Design Period:

The planning for the Sewerage System of Chamanahalli is being prepared for the year 2051 (30 Years) as the ultimate planning year. (CPHEEO Manual Sr. No. 3.2 Page 3-1).

Velocity of Flow:

The flow in sewers varies widely from hour to hour and also seasonally, but for the purpose of hydraulic design an 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 the design of the 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)

Flow:

As the Local body, we assumed that the Municipality will find ways and means to supply water to the town at a uniform rate of 150 LPCD in the areas. The rate of sewage generation is usually taken as 80-90% of the water supply. The estimated peak flow adopted for hydraulic design depends upon the contributory population by using the formula $\frac{\text{No houses} \times \text{Population} \times 80\%}{24 \times 3600}$ flow in LPS Peak factor we consider as 1.8.

Pipe Material:

We select concrete pipes and manning's roughness coefficient as 0.013 minimum, Minimum Allowable Cover is 1.5m and maximum Allowable Cover as 7 m. Maximum

Allowable Slope as 1:30 & Minimum Allowable Slope as 1:1000.

- The number of Pipes we have considered is 109.
- The number of Nodes we have considered is 110.
- Our last Node i.e. 35 will be connected to Sewage Treatment Plant.

We have considered 3 different diameters, as follows:

1. 150mm
2. 200mm
3. 250mm

## 3. RESULTS AND DISCUSSION

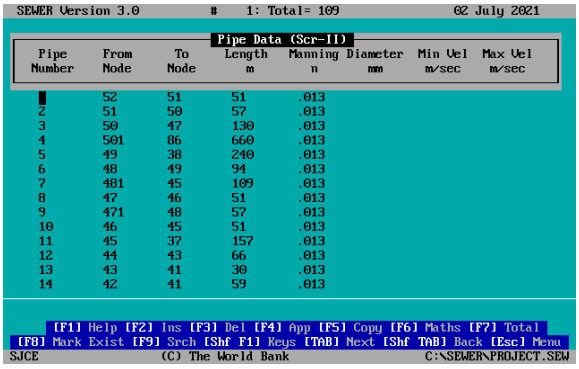


Figure 3. Input pipe data.

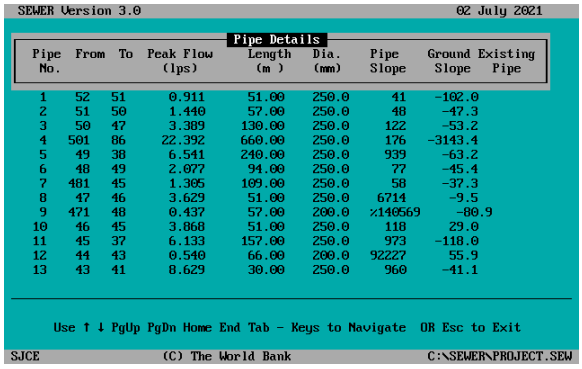


Figure 4. Output pipe details.

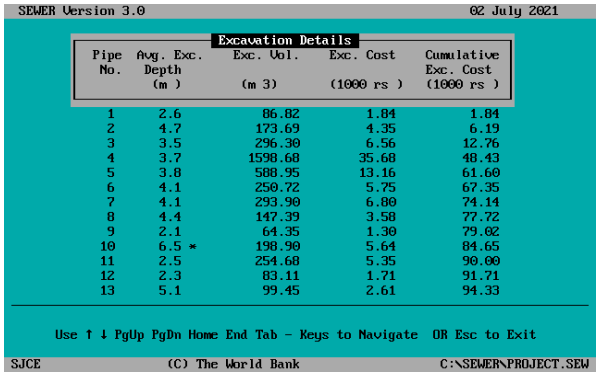


Figure 5. Excavation details.

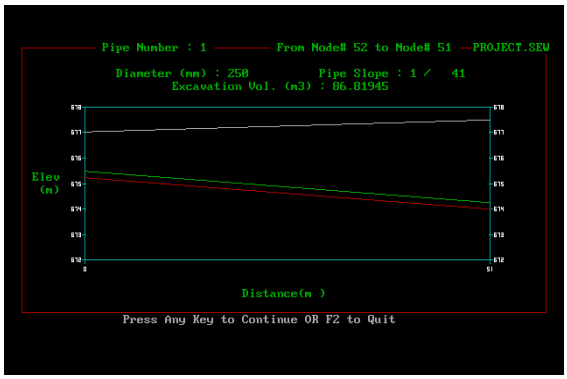


Figure 6. Hydraulic gradient line.

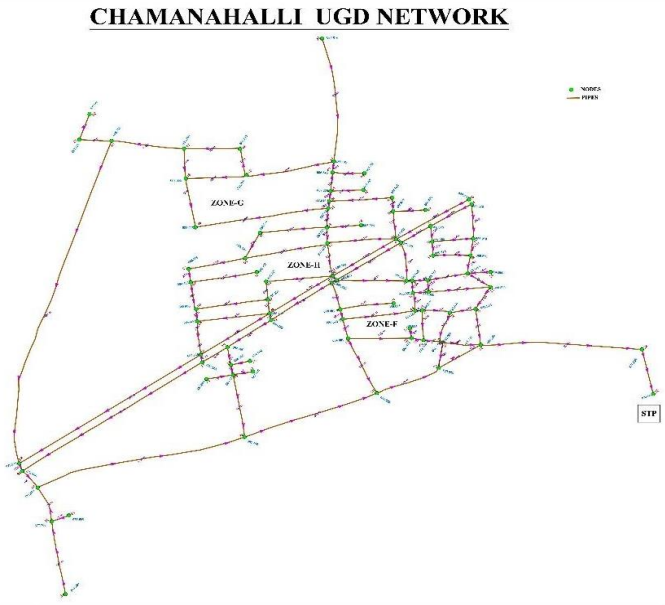


Figure 7. Proposed UGD network for Chamanahalli

Zone wise details of pipe diameter and length are given in the below table.

Table 1. Pipe diameter and length.

| Location | Diameter of Pipe (mm) | Length of pipe (m) |
|---|---|---|
| ZONE F | 150 | 531 |
| | 200 | 1029 |
| | 250 | 1140 |
| ZONE G | 150 | 386 |
| | 200 | 182 |
| | 250 | 1717 |
| ZONE H | 150 | 1101 |
| | 200 | 317 |
| | 250 | 2195 |

## 4. CONCLUSIONS

In this case we have studied the system of pipes and fittings that is installed below ground level to transport foul drainage or rainwater flows to a sewage treatment facility. In the proposed paper we have designed for Underground drainage system implying Sewer 3.0 is done for Chamanahalli, Bannur and prepared a proposed sewer map using QGIS and AutoCAD. The proposed Underground Drainage network is badly required as there was no existing drainage system. Most of the drains were open drains, more often than not sewage overflows, creating unsightly conditions and diseases and The total length of the sewer line is 8.607km having 150mm diameter pipe of length 2018m, 200mm diameter pipe of length 1537m and 250mm diameter pipe of length 5052m.The pipe cost for the entire Underground Drainage network is Rs.1,00,78,470.

## ACKNOWLEDGEMENT

We sincerely thank Mrs. Parinitha.T. Niranjan, Asst. prof. Environmental engg. for giving us an opportunity to work on this topic. We are grateful for her support and guidance that have helped us to expand our horizon of thought and expression. She was very helpful in finding solutions to several problems during the work. At last we must express our sincere and heartfelt gratitude to all other Professors and Staff of the Environmental Engineering Department who helped us directly and indirectly during this work.

## REFERENCES

[1] Rushikumar R Prajapati, Neha M Joshipura, Bhavan Patel, (2016) "Design of Underground Drainage for Anklav Town" International Journal for Scientific Research & Development Volume. 4, Issue 04, pp.735-739.

[2] Shruthi S Kannur, Sathosh Patil, Satish S Kumar, (2015) "Hydraulic Design & Analysis of Underground Drainage System: for a Zone in Tumkur City" Journal of Department of Environmental Engineering, Volume-2, Issue-05, pp326-332.

[3] J. A. Patil, Dr. Mrs. S.S. Kulkarni, (2014) 'Design and Mapping of Underground Sewerage Network in GIS, a Case Study of Islampur Town', Journal of Department of Civil Engineering, Volume – 3, Issue – 8, pp. 424-431.

[4] Shraddha Tiwari, Mangesh Borkar, (2020) "Design of Under Ground Drainage System for Rural Area", International Journal of Engineering and Technology, Volume-7, Issue-6, pp-1-7

[5] Veeravalli Srikanth, Manchikanti Srinivas, (2017) 'A Study on the Measures for Improvement of the Underground Drainage System', Journal of Department of Civil Engineering, Vol – 5, Issue – XI, pp. 480-488.