Design of Underground Drainage System for Kapuskhed Village

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Abstract:- The two basic essential amenities for a healthy living are safe water supply and hygienic sanitation facilities. The provision of safe drinking water precceds when talking about providing basic aminities to community. Although, the importance of hygienic sanitation facilities that are effective and low cost on-site sanitation, cannot be allowed to lag behind. This can be done through practicing and following the conventional sewerage and sewage treatment techniques. A proper knowledge about designing sewerage system is is important for high percentage of domestic water coming from village. If this huge quantity of water, that is already polluted and hazardous for human and animal health, is let into open streams without any prior treatment can cause heavy damages to human heath as well as to environment. Hence a proper network for carrying this sewage from its source to a Sewer Treatment Plant where it can treated and then disposed off safely, without harming the environment is very important to be designed. To achieve above objective, the study involving designing of a sewerage network for the kapuskhed village.

I. INTRODUCTION

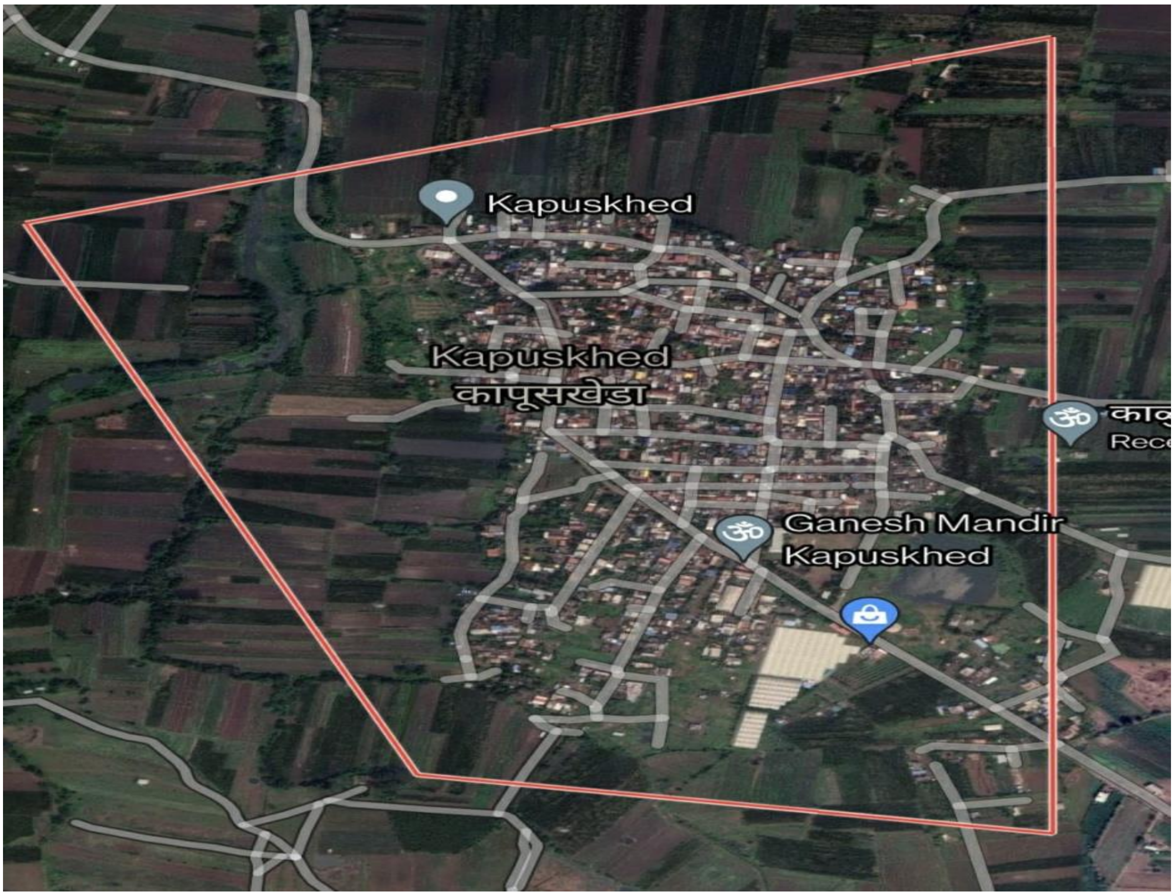
The underground drainage system has been designed for healthy envoirnment and proper disposal of sewage from the human society. Because of unfriendly nature of human waste, a drainage system should be "out of vision and out of sense". Most of the drainage systems are concealed from the eyes (underground). It is hence vital that it must be of superior quality and should be able to work a seemingly endless amount of time without leakage or deformities. It becomes nasty and expensive to address such issues that emerge in ordinary underground pipelines unexpectedly, and which may happen because of poor item quality.It is strongly advice for structures where hygiene is an important requirement. This project discusses the development and implementation and an efficient underground drainage system for Kapuskhed village in Maharashtra (India).

Kapuskhed is a village with a population of 4861 peoples. economic zone, no. of temples so, providing an underground drainage system. Kapuskhed village is an area of 600 hectares. Underground drainage is the general term given to the systems of pipes and fittings that are installed below ground level to transport foul drainage or rainwater flows to a sewage treatment facility or, in this case of rainwater, a watercourse. . There are common three types of sanitary sewage namely Domestic Sewage, Industrial Sewage, Storm Sewage. This underground system is a system that carries Domestic Sewage to the treatment plant. Talking about the systems of Sanitation the old conservancy system is way too different from the modern water carrying system.

a. Methodology:

We will adopt following steps:

- Literature Review.
- Set an Objective.
- Difining Problem Statement.
- Action Plan.
- Actual Implementation.
- Conclusion
- Report Preparation
- Publishing Paper



II. OBJECTIVES,ADVANTAGES,DISADVANTAGES AND PRECAUTION:

a. Objectives of the study:
1)Design underground drainage system for kapuskhed village.
2)Design are economically,fast deployment.

b. Advantages
- Enhances the appearance of the property.
- Less time of Labour Requirement.
- Reduce Soil Erosion.
- Removes Toxic Substances.

c. Limitations
- Expensive.
- Regular maintenance is requied.
- Can contaminate bodies of water.

d. Precautions
- Make sure that the soil is not too roomy while digging the recharge well.
- Make sure to cover the recharge well in right way while construction.
- Make sure to give overflow pipe for the recharge well to prevent water logging around the recharge well in case of overflow.
- Do not create a recharge well if the water table is within five feet from the ground level.
- The Stone packing should be done by skilled people in order to avoid caving or collapse of recharge well.
- Provide required concrete / brick lining and make sure that water is not entering into the recharge well from the sides as this may lead to collapse.

III. UTILIZATION OF DRAINAGE

a. Need for artificial drainage:
- Additional water in the crop root zone soil is injurious to plant growth. Crop yields are considerably reduced on poorly drained soils, and, in cases of prolonged waterlogging, plants eventually die due to a lack of oxygen in the root zone.
- Origin of more soil water that result in high water tables include: high precipitation in humid regions; surplus irrigation water and canal seepage in the irrigated lands; and artesian pressure.

b. Secondary drainage treatments:
- Methodes of improving the internal drainage of low permeability soils include: subsoiling, deep tillage, mole drainage, and biological practices, viz., cropping with deep rooted legumes (e.g., alfalfa) and crop rotations.
- Deep rooted trees are used to minimise the water table. There are usually no water quality hazards associated with these increase drainage practices.

c. On-farm source control:

- The most suitable method of minimizing environmental problems is to implement source control practices at the farm level. In irrigated parts, this can be achieved by improved irrigation water management.
- Big irrigation efficiencies and lined irrigation conveyance structures will reduce the amount of drainage water which needs to be removed.

d. Re-use of drainage water:

- In many parts where irrigation water is short, drainage water is used to meet crop water requirements. Re-use is only durable if the drainage water is of sufficiently good quality.
- The water quality concerns about drainage water re-use with plants of growing salt tolerance are that: the effluent may be high in salt content (in irrigated lands)

e. Re-use for crop irrigation:

- The major shame factor of re-used waters is the high concentration of ions.
- Waters with less ionic applications provide plants with an adequate supply of many of the essential nutriets, needed.

IV. REINFORCED CEMENT CONCRETE PIPE DETAILS

a. Purpose of pipe:

- A drainage pipe is any pipe used to facilitate the transfer of water from one place to another.
- The main purpose is to dispose of wastewater from homes, office buildings.

b. Advantages of pipe:

- The maintenance cost is low.
- The inside surface of pipes can be made smooth.
- The pipes are durable with useful life of about 75 years.
- The pipes can be cast at site work and thus there is reduction in transport charges.

c. Limitations of pipe:

- Affected by acids.
- Repairs are very difficult.
- Transportation and laying cost is high.
- Difficult to make connections.

d. Technical factor affecting the choice of pipe material:

1.Strength:

- Since the water flows through the pipes under pressure, hence material should be strong enough to resist the high internal pressure.

2.Resistant to corrosion:

- Material of pipe should resist the corrosion internally as well as externally.

3.Hydraulic properties:

- The pipe material should be smooth to avoid frictional losses and to produce higher hydraulic efficiency.

4.Maximum permissible diameters**:**

- Maximum permissible diameter may differ with different materials and hence it should be suited for different parts of water distribution.

5. Handling and jointing:

- It is quite often found that the pipe materials are suitable in handling and jointing.

e. Pipe details:

- Diameters from 150mm to1220mm
- Lengths of 2.5 meters
- Joint will be Flexible joint.

Dia. Of pipe	**Mean thickness**	**Wt. per 60 kg**
100	12	14
150	16	22
200	17	33
250	20	52

Pipe Details

f. Cost of pipe:

i. Concrete RCC Jacking Pipe:

- Rs.225/Square Meter

ii. Hume Concrete Pipes**:**

- Rs.100/Unit

iii. Boom Concrete Flowing Pipe**:**

- Rs.75,000/Ton

V. PROCEDURE FOR DESIGEN OF UNDERGROUND DRAINAGE SYSTEM FOR 50 YEARS

Procedure :

1) Fix map for required drainage system.
2) Draw the map of drainage pipe line with manholes.
3) find the length and slope of ground.
4) Find the length and slope of the pipes in between two manholes.
5) While designing of Excel sheet first column is line number second column is location and third column is for from -> to.
6)After that find length in kilometres of all pipes.
7)Then find the commulative by addition of length of pipe coming in same manhole.
8)Find the commulative length in kilometres.
9)Find the commulative area.
10)Excel will be made same as it is infiltration rate in m^3/d*km means in 1km per day per discharge in one day of infiltration.
11)Then convert d*km in m^3/s so multiple kilometres by commulative length. After that convert day to sec.
12)Then find Qaverage which is 320L/d*ha
13) Convert liter in m^3/s.
14)To find Qmax multiply Qavg*infiltration. In this way we will get discharge.
15)Now for minimum flow Qavg will remain same. (Average discharge).And infiltration in m^3/s.
16)Then for minimum discharge multiply minimum factor. (0.5) to average disharge to commulative area.

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17)Then do total of Minimum Discharge and Infiltration
18)Fix the diameter of pipe.
19)Find slope of ground and place the pipes.
20)To find the maximum angle use formula

$$\frac{-20.16n * \mathrm{Qmax}}{D^{2.6} * S^{0.5}} + \frac{(\theta - \sin\theta)^{\wedge}1.6}{\theta * 0.6} = 0$$

21)Then find Maximum area, Maximum Velocity and Maximum Depth respectively by,

Amax=$D^2 * (\frac{\theta m - \sin\theta m}{8})$; Vmax=$\frac{\mathrm{Qmin}}{\mathrm{Amax}}$; Depth=$\frac{D}{2} * (1 - \cos\frac{\theta}{2})$

22)To find minimum discharge repeat the above process from maximum angle. Replace Qmin by Qmax,

$$\frac{-20.16n * Qmin}{D^{2.6} * S^{0.5}} + \frac{(\theta - \sin\theta)^{\wedge}1.6}{\theta * 0.6} = 0$$

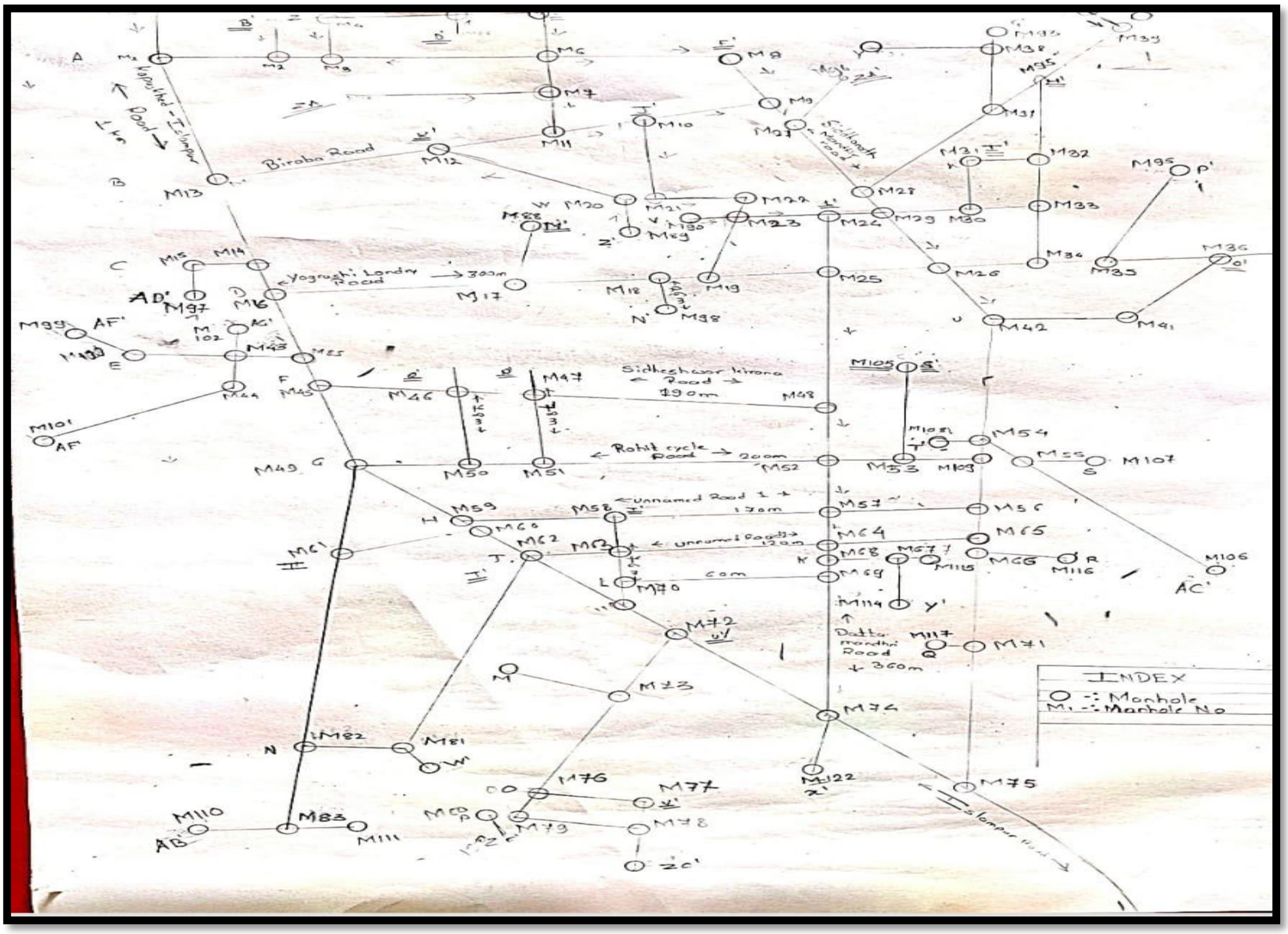
23)In this way we designed underground drainage system.
24)Find the fall in sewer by Slope*Length
25)Find upper and Lower end by-:
Upper end =Upper end*Ground-2-Thickness-D
Lower end=Upper end-Fall in sewer

VI. PLAN DETAILLING OF KAPUSKHED VILLAGE

a. Design under ground drainage system in excel sheet:

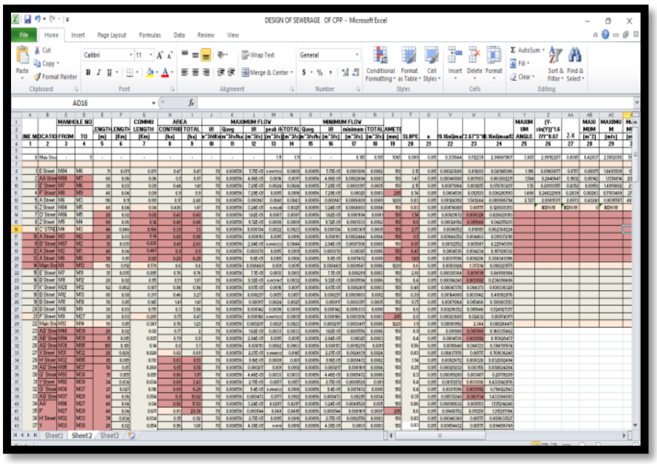
https://drive.google.com/file/d/13LAH4JB-T-ckVg4wTv28WUninPlrQHAk/view?usp=drivesdk

Below is a secure QR code

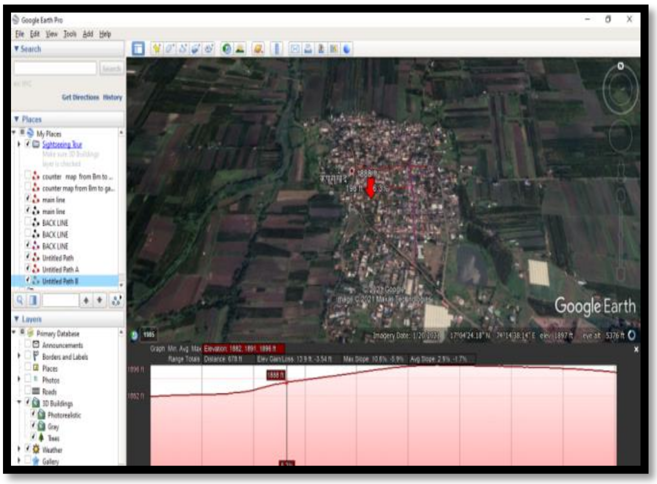


Plan Detailling Of Kapuskhed Village

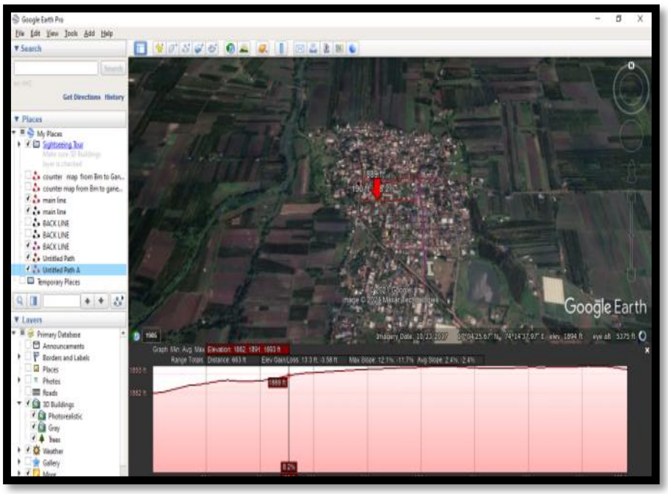
VII. OBSERVATION



Design in excel sheet



Determineing of slope



Determineing of length

VIII. CONCLUSION

For kapuskhed village we designed underground drainage system and conclude as follows:
1) Kapuskhed is the slow developing village.
2) Design and underground system is for 50 years
3) Underground drainage system reduce soil erosion.
4) Enhance the appearance of the village.

SCOPE OF FUTURE WORK

- We collected at to all general information from google of Kapuskhed village.
- Then we drawn the map of village. In that map we also drawn pipe laying map,by fixing the manhole.
- And then we started further calculation for underground drainage system.
- In future we can also design sewage treatment plant by taking reference of this project.
- And we can design next for water collected by under ground drainage system for agricultural use.

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Channel Name-: Marcos Luna.
Name of youtuber-: Marcos Luna.