**Planning a Sanitation network**

Overview:-

The sub-system deals with planning a proper sanitation network in rural areas. A proper sanitation network helps to take away all sewerage wastes properly from all houses and surrounding environment in a hygienic way, without causing stagnation or coming in contact with open areas \ roads \ other pipelines and spreading diseases.

Goal:-

.To provide a proper sanitation system more specifically sewage system (that can potentially replace the existing system).

.The sewer system capacity should be such that it can withstand the current sewage wastes and also the wastes possible in future.

.Maintaining high control over the flow of materials.

.Blockages and breakages should be minimized.

Conducting regular inspections on the functioning of sanitation network.

Requirements:

* Current population distribution pattern and future plans of growth (estimate present and future wastewater flow).
* Location details ,land use patterns and drainage patterns of the area.
* Water supply and zoning details.
* A recycle system for the wastewater collected like a stabilization pond.
* Sufficient financial resources.
* Skilled task force, that makes sure that sewer lines are maintained effectively.

**Design:**

* Obtain a topographical map of the area, preferably with a scale of 1 inch to 2,000 feet.
* Draw all possible sewer lines with due consideration that flow should be gravity-assisted.
* Plan for the installation of manholes.

**Design parameters:**

**Design period:**

The sewerage system was designed for a period of 25 years

**Peak flow**:

Peak flow should be estimated based on the size of population,percentage of water consumption that returns as sewage

**Proportional depth of flow:**

The depth of flow should be high enough for transportation of solids and is low enough to guarantee sufficient ventilation .the minimum and maximum values for the proportional depth of flow(d/D(depth to diameter of pipe)) are 0.2 < d/D < 0.8.

**Minimum gradient:**

A necessary slope is required to move the solids, so that it achieves the minimum self cleaning velocity for the expected design flow.

* Estimate the number of present and future connections each line will serve.
* We can estimate future wastewater flow by multiplying the projected population 25 years in the future by the estimated flow rate per capita per day (around 90liters in rural areas).

**Determining pipe size:**

Pipe size depends on the flow, slope and roughness coefficient of the pipe in use. Cumulative population along a sewer line is also a key factor in determining the diameter of the pipe needed. if no more than 1,000 residents live along a line, 8-inch diameter piping should be sufficient for the entire length of the line

Approximate pipe diameters for various populations along sewer line

|  |  |
| --- | --- |
| **Population** | **Pipe diameter** |
| 1 to 1,000 | 8 inches |
| 1,000 to 2,500 | 10 inches |
| 2,500 to 5,000 | 12 inches |
| 5,000 to 7,500 | 14 inches |
| 7,500 to 10,000 | 16 inches |

**Man holes:**

**Flushing man hole:**

They are located at the head of the sewer to flush out the deposits inside the sewer with water.

**Lamp holes:**

Lamp holes are openings constructed on straight sewer lines between two manholes which are far apart and permit the insertion of lamp into the sewer to find out obstructions if any inside the sewer from the next manhole.

**Junction chamber:**

Manhole constructed at the intersection of two large sewers.

**Detection of blocks/breakages:**

Positive displacement flow meters can be used to measure the sewage material flow in a given direction. This greatly reduces the blockage/breakage spot identification efforts and hence the repair time.

Quality Assurance:

* Design all sewer systems for the ultimate population with a design period of 25 years.
* Design new sewer lines on the basis of an average daily flow (in some cases we have to design the system for an average daily flow less than 135 liters per person per day in small rural communities, for example, 75 to 90 gallons).
* Use pipe 8 inches or more in diameter for new sewer lines.
* If sewer lines are less than 24 inches in diameter, lay them in straight-line alignment. (If that is not possible, install manholes at every change in alignment.
* The system should withstand and work normally in all climatic conditions.

Timeline:

We design the sewerage system taking into consideration the future population and wastewater flow hence the system implemented should work properly for a minimum of 25 years.

Cost effectiveness:

Once the layout of the wastewater collection and conveyance system is prepared, the future population of the service area and its wastewater flow estimated, and the pipe sizes determined, we can develop capital and operating cost budgets for the complete waste water system.

To achieve zero maintenance costs we can make the people aware of the waste materials which could block the flow in the system and those which could damage the pipelines.