DIGITAL EDUCATION
MARTCOST

Environmental Engineering : Part 1

Hand Notes For GATE, IES & PSUs

Hand Notes

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Note : *We also providing GATE & IES Materials [Handnotes, Shortnotes & Books], All Reports [Seminar Reports & PPT]*

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Sewage :-

* **Refuse :-** All the waste that is required in the form of solid, semi-solid & liquid form.

* **Garbage :-** It is the dry form of refuse, generally organic in nature, bio-degradable e.g vegetable matter. etc :-

* **Rubbish :-**
→ It is the waste which is generated from hotels, Restrau, offices etc. There are inorganic in nature, dry form & Combustibles.

* **Sewage :-**
It is the liquid waste that is generated from domestic & industrial sources.
It contains 99.9 % water, remaining solids :-

* **Sullage :-** It is the liquid waste which is generated from kitchen & other house-hold sources.
It is fresh, less foul in smell & light grey in colour.

* **Storm Water :-** It is the run off which is generated from the building sides, road sides & other catchment area :-

* Dry weather flow :-
→ It is the discharge that is available in any season.
(average)

* Sewer :-
→ It is a pipe-line that carries sewage.

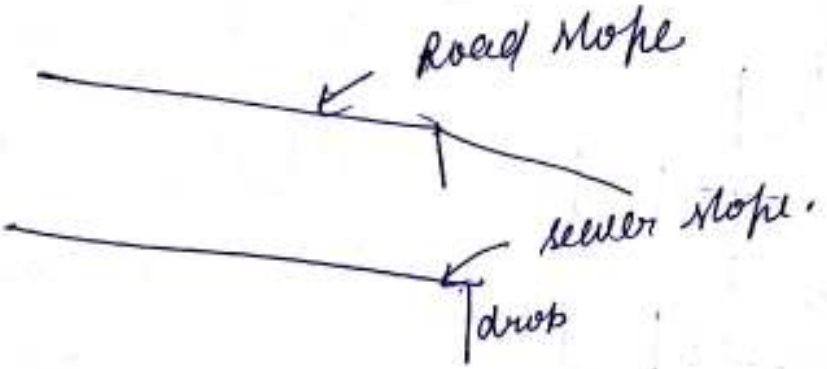
* Sewage System :-
It is a collection & connection of entire sewage.

* Types of Sewage System :-

→ @ Separate Sewage system :-
→ It is used when there is uneven rainfall distribution.
→ It is used in hilly areas (we can't excavate more)
→ It " " " the areas where deep excavation is not possible.
→ (Sewer are gravity flow)

→ water supply. (above)

→ Sewer



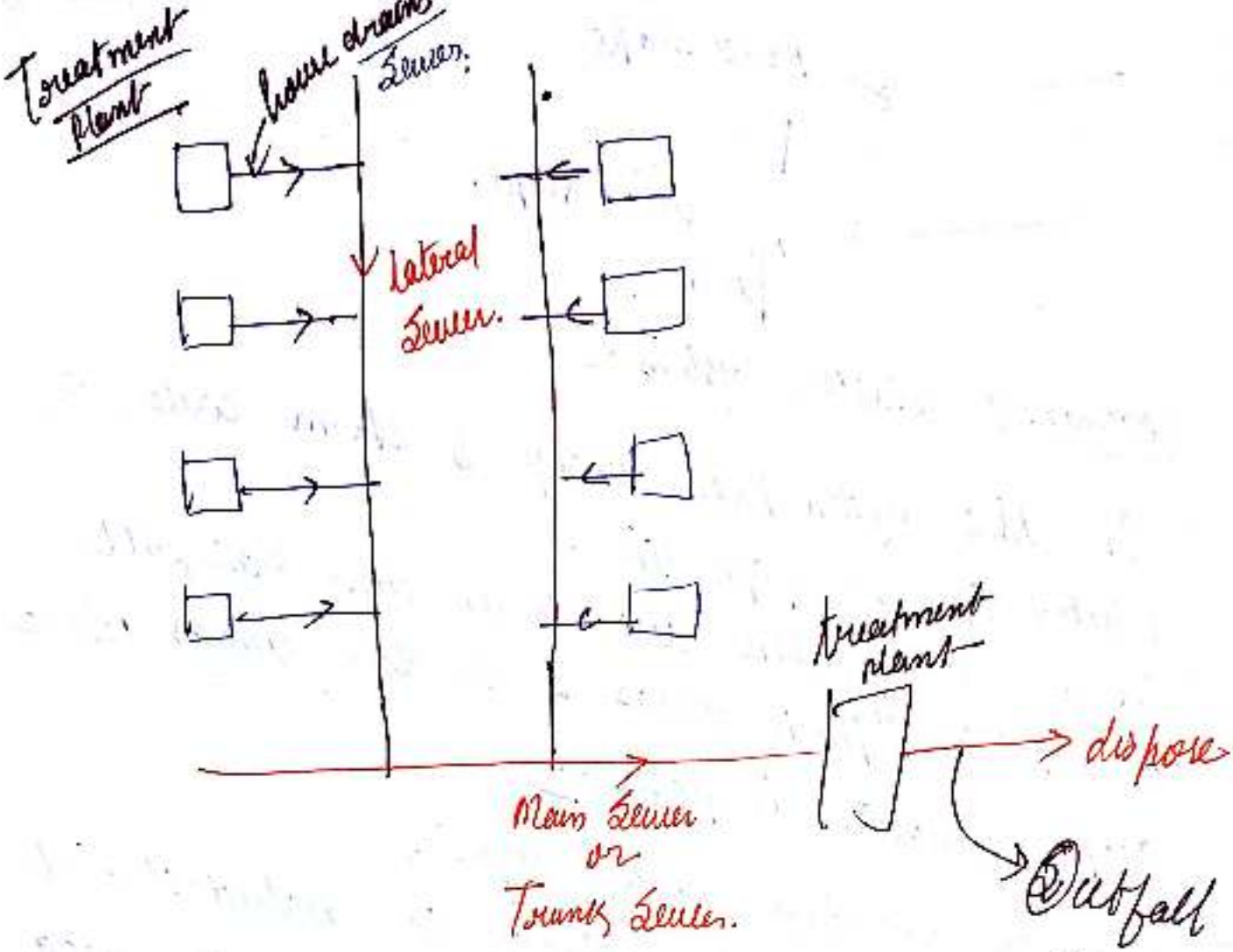
* Combined Sewer system :-

→ In this system both sewage & storm water is collected in one pipe line.
→ It is used when there is an even rainfall distribution, in plain areas & in the areas where deep excavation is possible.

© Partially Combined Sewage system :-

→ In this system all the sewage is included with a portion of storm water. It is generally used in metropolitan area.
→ The excess amount of water during heavy rains is carried out to the natural stream by mean of open drains.

* Pipes used in Sewage System :—



→ House Sewer is a pipe line that collects the domestic sewage & discharges into the lateral Sewer.

→ Lateral sewer is a pipe line that collects the sewage from all the house sewers & discharge it into the main sewer.

→ The main sewer or trunk sewer is the biggest pipeline or the part of sewage system

which carry all the discharge of sewage up to the treatment plant.

The outfall sewer is the section of pipeline that carries the sewage from the treatment plant to the disposal area.

Important points Regarding Sewer :-

(1) The flow of waste water in the sewer is steady & uniform.

(2) Sewer is designed for peak flow discharge.

(3) Sewer is always designed $\left(\frac{1}{2} - \frac{3}{4}\right)$ of the full as the reactions which are taking place inside the sewer due to decomposition of sewage leads to the evolution of gases there should be some space for those gases.

(4) Sewer pipeline should be designed for the gravity flow.

(5) The sewage treatment plant should be laid on the outskirts of the cities.

(6) Sewer are design for max^m hourly flow rate, as per design manual the max^m hourly

flow rate = 2 x average daily flow rate of sewage.

(7) The design discharge is based on flow condition where the sewer pipeline should be checked for a min flow velocity in order to prevent the silting & sedimentation of water.

The min hourly sewage flow rate $\Rightarrow \frac{1}{3}$ average daily sewage flow rate.

Design of Sewer pipe-line :-

10 marks (IES)

(a) Designing a Combine or partialy Combined Sewage system :-

Design steps :-

(i) If the population of town is P with the water supply rate of x - LPCD.
Then, the total water supply to the town is Px litre/day

(ii) out of the above total water supplied. (75-80)% of the water will converte into sewage & this will be the average daily