LECTURE NOTE

ON

WATER SUPPLY & WASTE WATER ENGG.

(TH.4)

5TH SEMESTER IN CIVIL ENGG.

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WS & WWE

(Th-4)

5th SEM.

SECTION A : WATER SUPPLY

SECTION B : WASTE WATER ENGINEERING

Introduction

Importance and necessity of water supply schemes:

For any living being water, air, food, shelter etc are the primary needs, for which water has the greatest importance. Pindar said, "Best of all things is water". Everywhere water is required for various purposes.

1- For drinking and cooking.
2- For bathing and washing
3- For watering of lawns and gardens.
4- For heating and air-conditioning systems.
5- For growing of crops
6- For street washing
7- For fire fighting
8- For recreation in swimming pools, fountains and cascades.
9- For steam power and various industrial processes etc.

objectives of protected water supply scheme

The main objectives of water supply system are

1- To supply safe and wholesome water to consumers.
2- To supply adequate quantity of water.
3- To make water easily available to consumers so as to encourage personal and household cleanliness.
4- To supply water at convenient points and timings.
5- To supply water at reasonable cost to the users.

Definition of water supply engineering.

→ Water supply engineering is a branch of civil engineering that deals with the development of sources of supply, distribution and treatment of water.

discoveries of mines, construction of railway stations etc.

The following are the standard methods by which the forecasting of population is done.

1- Arithmetical increase method.
2- Geometrical increase method.
3- Incremental increase method.
4- Decreasing rate method.
5- simple graphical method.
6- comparative graphical method.
7- Master plan method.
8- The logistic curve method.
9- The apportionment method.

1- Arithmetical increase method. :-

This method is based on the assumption that the population is increasing at a constant rate. The rate of change of population with time is constant.

$$\text{i.e } \frac{dP}{dt} = C \text{ (a constant)}$$

Integrating $P_2 - P_1 = C(t_2 - t_1)$

where P_1 = population at the time t_1 first census.

P_2 = population at the time t_2 last available census.

The value of constant C is determined.

Now the population after n decade can be determined by the formula.

$$\boxed{P_n = P + n \cdot C}$$

Example-1 The following data have been noted from the census department.

Year	population.
1940	8,000
1950	12,000
1960	17,000
1970	22,500.

Calculate the probable population in the year 1980, 1990 and 2000.

Sol?

Year	population	Increase in population.
1940	8,000	
1950	12,000	12,000 − 8,000 = 4000
1960	17,000	17,000 − 12,000 = 5000
1970	22,500	22,500 − 17,000 = 5500
	Total	14,500/-
	Average	$\frac{14,500}{3}$ = 4833

Year	population.
1980	22,500 + 1 × 4833 = 27,333
1990	27,333 + 1 × 4833 = 32,166
2000	32,166 + 1 × 4833 = 36,999.

(Ans)

2- Geometrical increase method.

In this method the average percentage of growth of last few decades is determined.

If the present population is P and the

CHAPTER-1
Introduction

SANITARY WORKS :-

Sanitary engineering starts at the point where water supply engineering ends.
The sanitary works can be broadly classied as:

1- collection works.
2- Treatment works.
3- Disposal works.

1- collection works.

→ The collection works are mainly meant for collecting all the types of waste products of the town.
→ Refuse is collected separately and the sewage is called separately.
→ The collection works should be such that waste matters can be transported quickly and steadily to the ~~treatment~~ works.
→ The collection works include the house drainage works ~~and the network~~ of sewers laid in the two to collect the waste water from individual disease bacteria and foul gases to escape in to the atmosphere inside the buildings and crowded localities.

2- Treatment works. :-

→ waste water treatment works are required to treat the sewage before disposal so that it may not pollute the atmosphere.
→ If the waste water is not treated it will do so many harms, few of which are:

i- pollution of water supplies for man, beast and industries.
ii- destruction of food, fish and other valuable aquatic life.
iii- contamination of bathing places and ice supplies.

3- Disposal works :-

The treated or untreated waste waters are disposed off in various ways by irrigating fields or discharging into natural water courses.

Definitions of some common terms, used in sanitary engineering.

1- Soil pipe: The term soil pipe is used to indicate the pipe which carries discharges from soil fittings such as urinals, water closets etc.

2- vent pipe :- The pipe installed for the purpose of ventilation is known as vent pipe.

3- Waste pipe :- The term waste pipe is used to indicate the pipe which carries discharges from sanitary fittings such as bath rooms, kitchens, sinks etc.

4- Bacteria :- These are microscopic unicellular plants or organisms. These are divided into three groups such as

i- aerobic
ii- anaerobic
and iii- facultative.

i- aerobic :- The "aerobic bacteria" require light and free oxygen for their existence and development.

ii- Anaerobic :- The "anaerobic bacteria" do not require light and free oxygen for their existence and development.

iii- facultative :- The facultative bacteria can exist in presence or absence of oxygen but they grow in plenty in absence of air.

5- Invert :- The lowermost level or surface of a sewer is known as its inverts.

6- Refuse :- The term 'refuse' is used to indicate what is rejected or left as worthless and for the study of sanitary engineering, it is divided into five types.

i- Garbage
ii- Sewage
iii- Storm water
iv- Subsoil water
v- Sullage.

i- Garbage :- The term garbage is used to indicate dry refuge and it includes decayed fruits, grass, leaves, paper pieces, sweepings, vegetables etc..

ii- Sewage :- The term sewage is used to indicate the liquid waste from the community and it includes sullage, discharge from latrines, urinals, stables etc., industrial waste and storm water.

(a) - combined sewage :- This indicates a combination of sanitary sewage and storm water with or without industrial waste.

(b) - crude or Raw sewage :- This indicates the sewage that is not treated.

(c) Domestic or sanitary sewage :- This indicates sewage mainly derived from residential or business buildings, institutions etc..

(d) - Fresh sewage :- This is used to indicate the sewage which has been recently originated or produced.

(e) - Septic sewage :-

This indicates sewage which is undergoing the treatment process.