Intake Structures :- In any water supply project the first step is to select the source of water from which water is drawn. The device installed for the purpose of drawing water from the source of water are called "Intake"

Factors governing for Site selection for Intakes :-

* Site should be near the treatment plant to reduce conveyance cost.
* Intake must be located in the purer zone of the source so that best quality water is withdrawn from source to reduce the load on the treatment plant.
* Intake must never be located in the vicinity of waste water disposal point.

* Intake must never be located near the navigation channels so as to reduce chances of pollution due to waste discharge from ships.
* The site should be selected such as to permit greater withdrawl of water, if required in future.

Selecting Location of Intake Structure :-

* Intake must be located at a place from where it can draw water even during the driest period of the year.
* The intake site should remain easily accessible during floods and should not get flooded.
* In meandering rivers, the intakes should not be located on curves or atleast on sharp curves.

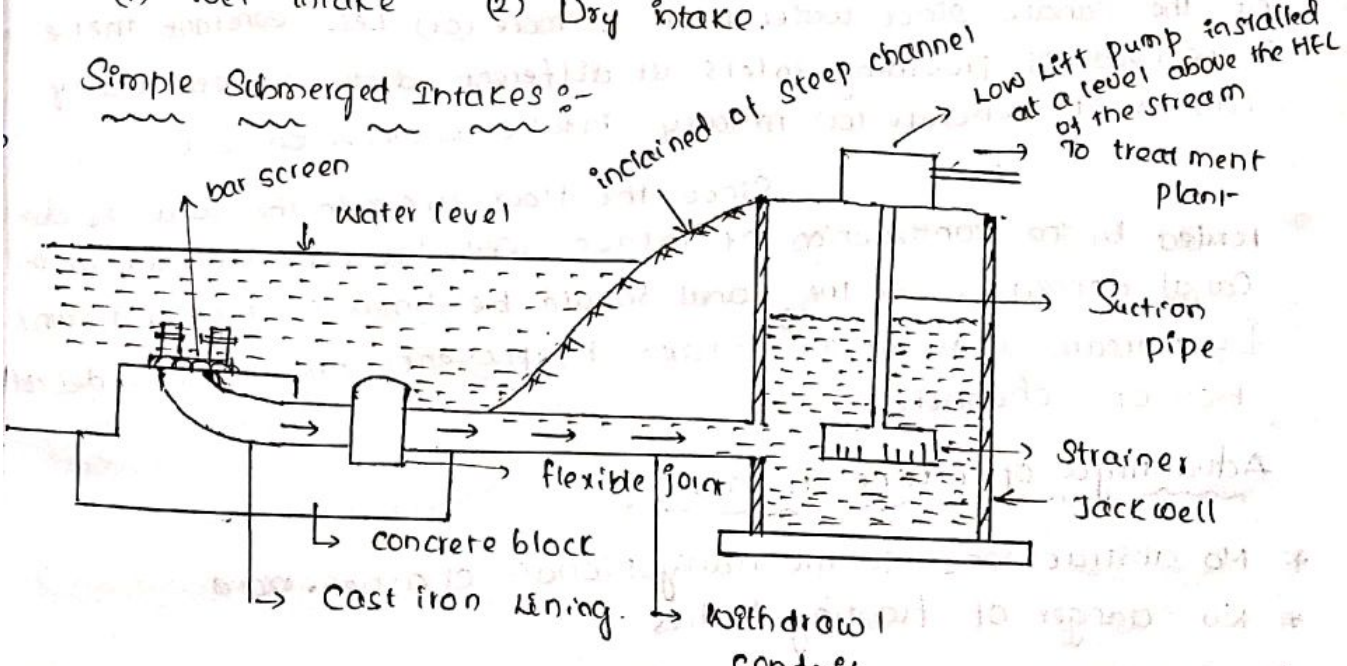
Types of Intake Structures :-

⇒ According to type of Source.
* River intake * Canal intake * Reservoir intake.
* Lake intake.

⇒ According to position of intake.
(1) Simple Submerged intake
(2) Exposed intake

⇒ According to presence of water in the tower
(1) Wet intake (2) Dry intake.

Simple Submerged Intakes :-



* It consists of a simple concrete block or a rock filled timber crib supporting the starting end of the withdrawal pipe.
* The intake opening is generally covered by screen so as to prevent the entry of debris, ice etc. in to the withdrawl conduit.

* Intakes, where silt tends to settle down, the intake opening is generally kept at about 2 to 2.5 m above the lake bed level to avoid entry of silt.
* they are cheap & do not obstruct navigation.
* They are widely used for small water supply projects.
* Limitations is that they are not easily accessible for cleaning & Repairing.

River Intakes:- A River intake is located on the upstream side of the city to get comparatively better Quality of water. They are either located sufficiently inside the river so that necessary demand of water can be met in all the seasons of the year.

* The intake tower permits the entry of water through several entry ports located at various levels to cope with fluctuations in the water levels during different Seasons.
* This are also called as "penstocks" The penstocks are covered with Suitable design Screens to prevent entry of floating impurities.

Canal Intakes:-

In case of small town a nearby irrigation canal can be used as source of water. The intake well is generally located in the bank of the canal. since water level is more (or) Less constant there is no need of providing inlets at different depth. It essentially consists of concrete (or) masonry intake chamber (or) well.

Since the flow area in the canal is decreased by the construction of intake well, the flow velocity in the Canal decreases, so the canal should be lined on the upstream Downstream side of the intake to prevent erosion of sides & bed of channel.

Advantages of Intake Structures:-

* No abstructions to the navigational channel.
* No danger of floating bodies

Design procedure for Intake:-

* If population is given and rate of water supply is given the discharge required by the city (or) town
* Q = Population * Rate of Supply.
* The Screens (Coarse Screen) is assumed around 0.15 Lit/sec

and also the verticle bars are 15 to 20 mm dia. and center to center spacing 20 to 50 mm.

* Area of screens = discharge / velocity of screen.

$$Q = \text{Area} * \text{velocity}$$

* Length of screen = $\frac{\text{Area}}{\text{height}}$ @ the assuming value of the bell mouth velocity 0.3 to 0.35

Design of intake conduit :-

* Asume the velocity of flow through conduit, generally 1.0 to 1.5 m/sec
* find $A = \frac{Q}{V}$ then using Hazen william formula. find the head loss and slope. reauired charts can be used.

* Design a bellmouth canal intake for a city of 75,000 persons drawing water from a canal which runs only for 10 hours a day with a depth of 1.5 m also calculate the head loss in the intake conduit if the treatment works are 1/4 th km away. given average consumption per person equal to 150 lit/day. assume the velocity through screen and bell mouth to be less than 16 cm/sec and 32 cm/sec respectively?

Sol:- Given data is

Depth of bell mouth (d) = 1.5 m

Population

Conveyance of water :- When water is transport from the to the treatment plant. The conveyance of water is divided into 2 parts ① Gravity conduits ② pressure conduits (or) pipe conduits

Gravity Conduits :- The water is enter to the conduit under gravity. The are the following forms.

① Canals (0.6-0.9 m/sec) ② flumes manmade structures (high velocity) ③ Aquiduts. (Horse shoe shape) - economical (0.9 m/sec)

* "Gravity conduits" (or) "open channel conduits"

Pressure conduits :- These are also known as "pipe conduits" The water enter into the conduits under pressure. These pipes manufacturing from different materials, cast iron, steel, Rcc etc.

* The velocities is 0.6 to 0.8 m/sec

Pipe materials :-

The selection of pipe materials the following considerations

* Water carrying capacity.
* Strength
* Durability
* Quality of water. to be conveyed and its corrosion effect.
* Intial cost and maitenance cost.
* Availability of material and easily transportation.

● Various materials used for pipe lines :-

* Cast iron pipes * Steel pipes * Concrete pipes
* Asbestos pipes * Galvanized iron pipes.
* Plastic pipes.

Cast iron pipes :- These are in circular shape.

(2) The cast iron pipes are manufactured by sand moulding (or) centrifugal process.

(3) The cast iron pipes having the joints are used Socket (or) Spigot joints are used and also flanged joints are used The expansion joints are used at particular places.

(4) As per the ISI (Indian standard institute - 1536 (or) the Socket and Spigot lengths are → 2.0 m, 3.8 m, 20., 4.8, 5.0, 5.5 m flanged joints

ends are 2.0, 3.6, 4.8, 5.5 m

ADVANTAGES OF CAST IRON :-

* Strong * durable (life span of cast iron pipes are 100 years)
* Economical * Easily jointed * Resisted to corrosion

DISADVANTAGES :-

* Easily to brake during the transportation.
* Due to tubarculation the water carrying capacity is reduced. (Pipe inner surface is ruff)
* Cannot be used high pressure above 7 Kg/cm

Steel pipes :- * These are manufactured by welding the sheets.

* These pipes are coated with anti corrosive coatings (cement & mortar)
* The expansion jointed are used for temparature stresses.

ADVANTAGES OF STEEL PIPES :-

* Compared to cast iron pipes these are strong and cheap.
* Easy to handle to transport.
* Obtainable large lengths to minimize the NO of joints.

DISADVANTAGES :-

* Susceptable for corrosion.
* Life is short Unless protected by the Special Coatings

Concrete pipes (PCC and RCC) :-

* These are prepared by plane concrete and Reinforced cement concrete and prestressed cement concrete
* For smaller diameter 610 mm plain concrete is used
* For large diameter 2.5 m they are reinforced cement concrete with steel reinforcing.
* And prestressed cement Concrete 0.08 to 0.18 meters.

ADVANTAGES :-

* Strong and easy to resist external loads.
* The life span is 75 years
* The internal Surface is very Smooth and Reduce frictional losses Easy to construct, do not required expansion joints.

Disadvantages :-

* These pipes are heavy to handle, to transport.
* Leakage due to shrinkage and Cracks difficult to repair.
* joints the pipes is difficult.

(4) Cost is Economical.

Asbestos cement pipes (or) AC pipes :-

* The Asbestos cement pipes manufacturing by rotating on steel mandrel mixing with the cement and asbestos fibre to the desirable thickness and compacted b/w steel pressure rollers.
* The available diameter from 5 to 90 cm

ADVANTAGES :-

* Easy to handle and to transport.
* Economical in laying and jointing
* It is suitable for small size distribution pipes
* Highly resistance to corrosion, tuberculation action of acids, alkalis and electrolosic.

DISADVANTAGE :-

* These are very costly pipes.
* Brittle and hence unsuitable.
* It cannot be used for high pressure.
* easily break on damage by excavating tools.

Pipe JOINTS :-

(1) Spigot & socket joint
(2) flanged joint
(3) joints for concrete & AC pipes
(4) Expansion joint
(5) Mechanical joints.

Biological impurities for finding Bacterial test :-

There are 3 methods for finding the biological impurties.

① Total count method
② E-coil test
③ Membrane filter method.

* E-coil test is determining in two coarses those are

① E-coil
② MPN value test

Standards for Water based on WHO and I.S

S.No	characteristics	Highest desirable level	Max possible level.
1	Turbidity units on jaccion scale	5	10
2	colour units on platinum	5	50
3	Taste & odour	Unobjectionable	Unobjectionable
4	pH units	7 - 8.5	6.5 - 9.2
5	Total solids	500	1500
6	chlorides	200	600
7	Sulphates	200	400
8	Total Hardness (as CaCO3)	200	600
9	Nitrates	45	45
10	Flourides	1.0	1.5
11	Iron.	0.1	1.0
12	Managnese	0.05	0.5
13	copper	0.05	1.5
14	Zinc	5	15
15	Calcium	75	200
16	Magnesium	30	150
17	phenol	0.001	0.002
18	Anionic detergent	0.02	1.0
19	Arsenic	0.05	0.05
20	cadmium	0.01	0.01
21	Hexavalent chromium	0.05	0.05
22	cyanides	0.05	0.05
23	Lead	0.1	0.1
24	selenium	0.01	0.01
25	Mercury	0.001	0.001
26	Gross alpha Activity (pCi/l)	3	3
27	Gross Beta Activity (pCi/l)	30	30

Water borne dieseases and their control :-

(1) Presence of Micro organisms :-

(2) Presence of parasitic ova

(3) presence of inorganic matter.

(4) presence of organic matter.

(5) Controlling :- The complete controll of water borne diseases Prove instituting an environmental health programme. that incarporate personnel and house hold and higen, control of fly spicies and other insects and monitoring of food processing immunization of populace where possible and dropper scientific waste disposal and water treatment, to removal of harmful, constituents.

Distribution Systems

Distribution System:-

The distribution system is that part of the water works which receives the water from the pump station by the gravity flow & supplies it through out the areas.

Requirements:-

1. The distribution system should be such as to furnish water in good quantities & pressure to all parts of the areas served.
2. The distribution system should be reliable.
3. protecting the supply mains, valves. The mains would normally be required to be laid with a sufficient cover of above 0.9m.
4. The distribution system should be economical in its design layout & construction.

Methods of supply:-

Water may be supplied to the consumers either

1. For a few fixed hours of the day.
2. For all the 24hrs of the day. A continuous met

of supply is always better than the intermittent method because of the following reasons.

a). When the supply of water is only for a few fixed hours of the day Consumers are to store water for use during the non-supply hours.

b). The unused water of storage tanks is most likely to be thrown out to the replaced during the supply hours by fresh supply of water i.e., this is a wasteful use of water

c). Incase of fire brakes out during the non-supply hours damage would have resulted before the supply Could be turned & fire brakes

d). During the non-supply hours pressure in the distribution mains may fall below atmospheric pressure

2/3/18

Layout of distribution System:-

There are four different systems of distribution depending upon the methods of layout of the pipe System.

(1) Dead end (or) Tree System (2) Grid iron System

3) Circle (or) Ring System 4) Radial system.

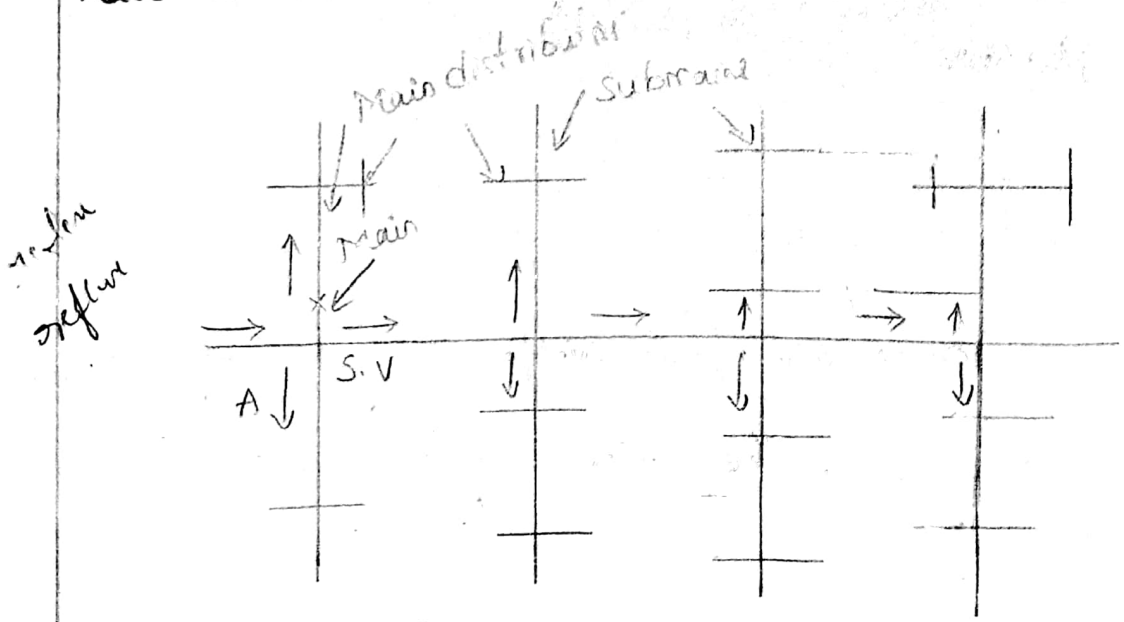
1. Dead end system:- Comprises a supply main starting from the service reservoir & laid along the main road, with Sub-mains running at right angles to it in both directions & laid along other roads joining the main road. Across the Sub-mains run the mino distributors (or) branches, laid along streets & connecting buildings & houses.

Advantages:

1. Its relative cheapness
2. Easy determination of discharge & pressure at any point in the system.

Disadvantages:

A large district is to be cut out when repairs have to be made to an important pipe.

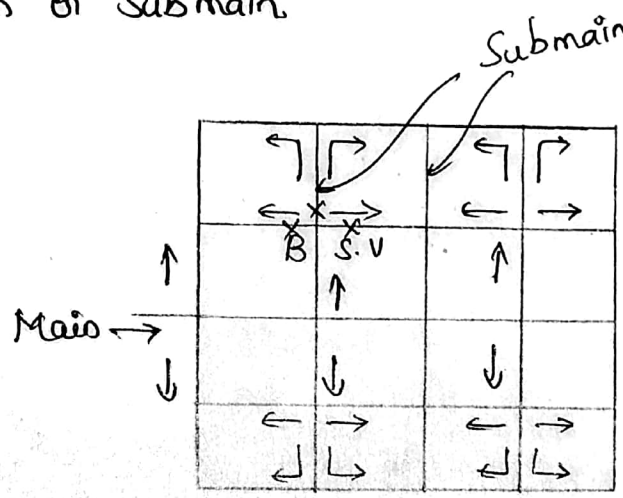


2. Grid iron system:- It is an improvement over the dead end system caused by connecting the ends of

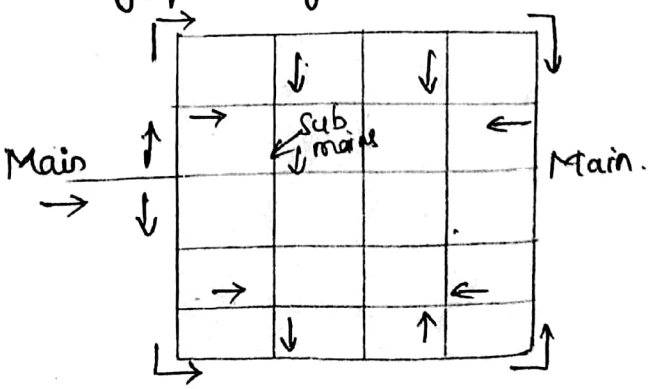
the various mains so as to eliminate the dead ends. Such a system is very useful for a city.

Advantages:

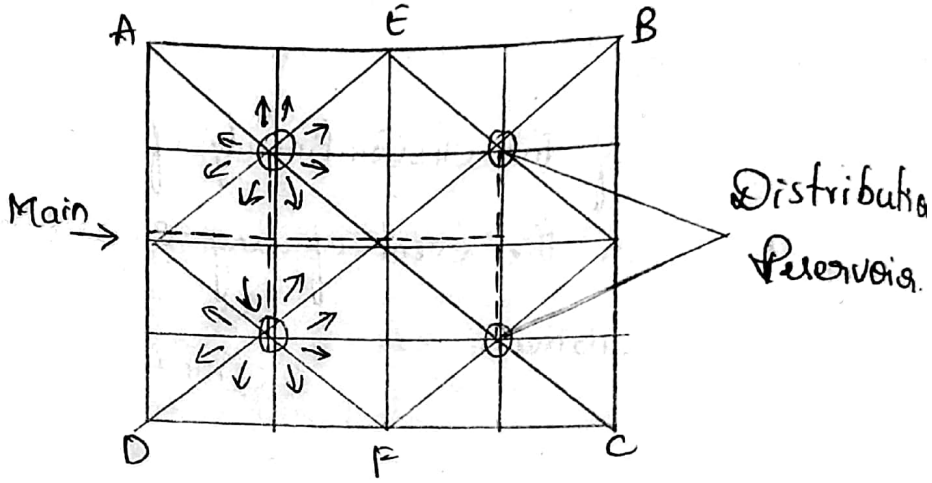
1. Avoiding of any stagnation due to water circulating continually.
2. Absence of the discontinuity of water supply anywhere in the event of any repair-work to a main or submain.



Circle (or) Ring System:- This consists of cutting the entire district into circular & rectangular blocks & then laying the mains all along the peripheral roads with submains branching out from the mains and running on the inner roads & streets. Water can be supplied to any point from at least two directions



Radial system:- This system is the reverse of the ring system, water flowing towards the outer periphery instead of from it. This system is most advantageous with the "direct-indirect system" for obvious reasons.



Discuss the role of environmental engineer in environmental management.

1. To ensure Sustainable use of air, water and land resources.
2. Devise ways to minimize pollution of the environment.
3. Co-ordinate the environmental improvement programs
4. Advise the government agencies & Corporations about environmental litigations
5. Solve the problems related to the environment
6. Manage the accounts related to the proposed Project activities.
7. Evaluate & assess the impact of the project activities & implement mitigation measures prior to decision making
8. Support the goals of environmental protection & Sustainable development.

1. Design period:-

The term design period for a water distribution system refers to the duration during with the different Components of water supply scheme are

are designed, is called as design period.

Different Components of water Supply scheme

Schedule:-

1. Storage of water by dams & reservoirs
2. Water treatment units
3. Electric motors & pumps.
4. Water Conveying pipes
5. Water distribution System

Factors of design period:-

1. In water supply projects, the period of design must be almost equal to the use of materials
2. Expected expansion rate of the town
3. Funds available for the project Completion shou be more, so that the period of design will be les
4. To Complete the project, the rate of interest on t loans plays an important role. In Case of less rate of interest it Can be acceptable for increased des Period must be small.
5. In life of the pipe & other structural materials the period of design must not have more life tha

- the materials & components used in the scheme

WHO guide lines for drinking water:-

1. The world health organisation was set up in the year 1948 with the objectives of promotive the attainment by all people of the heighest possible level of health.
2. In WHO has a wide range of functions, which includes promoting the improvement of nutrition, housing, sanitation, recreation, economic (or) working conditions with a bearing on health & other aspects of WHO is establish.
3. One of ~~it~~ the main role of WHO establish is international max to prevent human health
4. Since 1958, as part of its activities on drinking water of health, the organisation ~~of~~ has published at around ten years of intervals, several editions of internal standards for drinking water of subsequently.
5. The guide lines for drinking water quality is one of the ~~drinking water quality is one of the~~ largest standing normative publication of WHO

6. They provide on evidence based point departure for a standard setting of regulation or a basis for health organics protection.

7. They include on assesment of the heath risks presented by the various microbial, chemical, radiological & physical Constituents that may be present in drinking water

8. The WHO guide lines recommend pro-active efforts for assess of reduce health risks.

9. They focus on Catchment initiatives for long-term improvements in water quality whenever possible rather than expensive treatment operation with o going costs of large Carbon foot prints.