

Importance of safe water supply system

Water Supply System It is the infrastructure for the collection, transmission, treatment, storage, and distribution of water for homes, commercial establishments, industries and irrigation as well as for such public needs as fire fighting and street flushing.

People depends on water for cooking, washing, carrying away wastes and other domestic needs.

Water supply system must also meet requirements for the public, commercial and industrial activities. In all the cases water must fulfil both quality and quantity requirement.

Water constitutes one of the important physical environments of man and has a direct bearing on the health and hygiene of mankind. There is no denying the fact that the contamination of water leads to numerous health hazards.

Needs of water Supply system :->

main objective of any public water supply system are as follows.

- (i) To supply safe and wholesome water to the consumer.
- (ii) To supply water in adequate quantity.
- (iii) To make water available within easy reach of the consumer so as to encourage the general cleanliness.

Importance of safe water supply system :->

- The growth of new industries for various pipe appliances such as air valves etc take place in the locality granting employem^t opportuⁿ..
- The industries which pull water for their working are saved from the expenditure of installing their own water purification plant.
- The installation and maintenance of the water supply scheme grant opportunities of employem^t to the local people.
- The public in general gets treated reliable water for consumption and other uses.
- The Sanitation of the area is considerably improved by the adequate water supply.
- There are less chances of water borne diseases to occur resulting in saving of human lives and working hours.
- The available water in the locality is used in the best possible manner and its misuse and wastage are avoided.

Domestic water requirement for urban and rural areas

A small quantity of water is required by a man under his personal use.

But this demand of water for other purposes will naturally depend upon the standards of living and degree of culture.

The demand of water for various purposes is divided into five categories.

- (i) Domestic purpose
- (ii) Civic or public purpose
- (iii) Industries purpose
- (iv) Business or trade purpose
- (v) Loss and waste

(i) Domestic Purposes →

The quantity of water required for domestic purpose are divided into follows.

(i) Drinking

A human body contains 70% of water. The consumption of water by a ~~water~~ man is required for various physiological process such as for blood formation etc. If water for drinking contains undesirable elements, it may lead to epidemic. In fact the drinking water should be protected, potable, as fresh.

(ii) Cooking The quantity of water required for this purpose will depend upon the stage of advancement of family in particular and society. The amt of water required for cooking ~~amount~~ is about 1 ltr per capita per day.

(iii) Bathing → The quantity of water required for bathing purpose will mainly depend on the habits of people and type of climate.

In Indian bath, the quantity may be assumed 30 to 40 ltr and for tub bath is assumed as 50 to 80 per Capita per day.

(iv) Washing hands face etc

depend on habit of people and roughly assumed to be 5 to 10 ltr.

(v) Household purposes, water is required for washing clothes, floor, utensils etc and it may be assumed 5 to 10 per Capita per day.

Civic or public purposes

(i) Road washing | The roads with heavy amount of dust are to be sprinkled with water to avoid inconvenience to the user. Water required is about 5 ltr per Capita per day.

(ii) Sanitation purposes | On this division, water is required for cleaning public sanitary blocks, large markets etc and for carrying liquid waste from houses. Water is assumed to be 2 to 3 ltr per Capita per day.

(iii) Ornamental purposes

For decoration in gardens, such as fountains, or ponds are sometimes provided. These objects require huge quantity of water for their performance.

Industrial purposes

- (i) Factories :- The quantity of water required for the purposes involved in factories will naturally depend on the nature of products, size of factory etc and it has no relation with density or pt.
- (ii) Power stations A huge quantity of water will be required for cooling of power stations.

(iii) Railways

Business or trade purposes

Some trades such as dairies, hotels, laundries, motor garage etc required large amt of water. The no. of such business centres will depend upon the population and for a modern city is more 15 to 25 lit per capita per day.

Loss and waste

The quantity of water under this category is sometimes termed as unaccounted requirement. It includes the carbon use of water, leakage of man valves, other fitting etc.

Factor affecting water requirement \Rightarrow

(i) Climate Conditions

The requirement of water in summer is more than in winter. But also in extreme cold, people seek open their taps to avoid freezing of pipes.

(ii) Cost of water

~~The cost also play~~

\uparrow the cost

\downarrow demand of water

(iii) Habit of people

For high value premises, the consumption rate of water is \uparrow than the low value premises.

(iv) Industry it may also affect the rate of demand. But no relation between Industries and population.

(v) Policy of metering

Quantity of water supply through the meter will reduce the rate of consumption of water.

Source of Water Supply

Source of water supply are to be classified into two categories:→

- (i) Surface water
- (ii) underground sources

(i) Surface water,

(i) Lakes and streams→

A natural lake represents a large body of water within land with impervious bed. Hence, it may be used as source of water supply scheme for nearby localities. The quantity of runoff that goes to the lake should be accurately determined and it should be seen that it is at least equal to expected demand of locality.

Similar, is the case with streams which are formed by the surface runoff: It is found that the flow of water in stream is quite ample in rainy season.

(ii) Ponds, is a man-made body of standing water smaller than a lake. These ponds are formed due to excessive digging of 'groom' for the construction of roads, houses etc and they are filled up with water in rainy season. The quantity of water in pond is very small and it contains many impurities.

(iii) River, is naturally flowing watercourse usually freshwater flowing towards an ocean, sea, lake etc. In some cases a river flows into the ground and becomes dry at the end of its course without reaching another body of water.

Storage reservoir

An artificial lake formed by the construction of dam across a valley is termed as a storage reservoir.

→ a dam to hold water.

→ A spillway to allow the excess water to flow.

→ A gate chamber containing necessary valves.

Underground Sources

(i) Infiltration galleries

An infiltration gallery is a horizontal or nearly horizontal tunnel which is constructed through water bearing strata. It is sometimes referred to as horizontal well.

(ii) Infiltration wells / In order to collect large quantities of water, infiltration wells are sunk in series in the bank of river. The wells are closed at top and open at bottom. They are constructed of brick masonry with open joints.

(iii) Springs / When ground water appears at the surface for any reason, springs are formed. They serve as source of water supply for small towns, especially near hills or base of hills.

Some springs discharge hot water due to presence of sulphur and other minerals in their formations. These hot springs cannot be used to supply water for domestic purposes. But hot water is found to cure some of the human diseases.

Wells →

A well is ~~form~~ defined as an artificial hole made in the ground for the purpose of tapping water. The holes made for tapping oil are known as wells.

In India, the chief source of water supply for most of its population is wells and estimated 75 to 85% of Indian population has depend on wells for water supply.

Intakes for Water Supply

Site selection for intake →

- Intake work should provide purer water so that treatment may be less exhaustive.
- Site should be well connected by roads.
- Site should be such that intake should be in position to provide more water.
- During floods, the intakes should not be submerged by flooding water.
- As far as possible, the site should be located on the upstream side of the town / city.

Design of Intake →

- Intake should be sufficiently heavy so that it may not start floating due to upthrust of water.
- The foundation of the intake should be taken sufficiently deep to avoid overturning.
- Intake should be of such size and be located that sufficient quality of water can be obtained from the intake of its circumference.

Types of intakes

Submerged intake

Submerged intake is the one which is constructed entirely underwater. ~~It~~ It is commonly used to obtain supply from a lake.

River Intake

It is a type of intake which may either be located sufficiently inside the river so that the demands of water are met with in all the seasons of the year. If the water level in the river is low, a weir may be constructed across it to raise the water level and divert it to intake tower.

Reservoir Intake

When the flow in the river is not gauged throughout a year, a dam is constructed across it to store water in the reservoir so formed.

Lake intakes

it is similar to R.I.

1. If depth of water near the banks is reasonable.

If depth of water near the bank is shallow and greater depth is available only at its centre - a submerged intake is provided.

Canal Intake In some cases, source of water supply to a small town may be an irrigation canal passing near or through the town. Then it will be constructed. It is constructed inside the canal bank.

Transportation of Water

The term transportation refer to taking of water from source to purification plant and from treatment plant to consumer.

Water supply system broadly involves transportation of water from the source of area of consumption through free flow or pressure mains.

If the source is ~~at~~ higher than the treatment plant, the water can flow under gravity automatically. Similarly, after necessary purification of water, it has to be conveyed to the consumer.

Open channels \rightarrow In any water supply system, raw water from source to treatment plant may be carried in open channels.

Economical section in OC are generally trapezoidal while rectangular from economical ~~from~~ when crop culting is involved.

- \rightarrow The initial cost and maintenance cost may be high.
- \rightarrow not recommended for conveyance of raw water.

Adueeducts \rightarrow These can be used for conveyance of water from source to treatment plant or for distribution.

- \rightarrow In Ancient times, rectangular adueeducts are used but these days circular or horse shoe are more common.
- \rightarrow It is economical and easy to build.

Tunnels are used to convey water into the cities from outside sources.

- \rightarrow Horse shoe shape tunnel is used for water is not under pressure.
- \rightarrow Circular cross section is best if we have to convey water under pressure.

Pipes

- 1. A pipe is a circular closed circuit which is used to convey water from one point to another, under gravity or under pressure.
- 2. If pipes are not run full, they are called to flowing under gravity.
- 3. If pipes run full, then they are running under pressure.

Cast iron pipes

- Cast iron pipes are used majority of water conveyance mains.
- Cast iron pipe is resistance to corrosion & accordingly long lived.
- moderate cost

Steel pipe of small diameter can be made from the solid.

- These joints may be either flange or longed.
- Cannot be easily made to resist high external pressure.

Cement Concrete pipes

- Cement concrete pipes may be either plain or reinforced.
- They may be either pre-cast or may be in cast-in-situ.
- Plain Cement concrete pipes are used for heads up to 7m.
- Reinforced cement pipes are normally used to heads up to 6m.