Unit 3 : Water Management

Chapter 3 : The journey of water : Dam to house

Water is supplied through water taps, pipes in urban areas. Even when tap water is not available in summer, water is supplied using tankers. So many of us would love to know how this water reaches us from the dam and what processes are done on it.

Sources of the water

The existence of water on the planet Earth is one of the most important miracles in the universe. About 71% of the Earth surface is covered by water. There are many sources of water on earth. The journey of rain water on the earth is mainly after it rains and this journey, depending on the local geographical conditions. The journey of rain water is as per following way mountainhead-brooklets-springs, streams, runnels-rivers to wells, borewells, seas, oceans.

Dams, check dams, lake

Many rivers have small and large capacity dams. There are approximately 45000 large dams in the world. Of that, 22,000 are in China. There are 4200 dams built in India. Maharashtra has 40 of the largest dams in India. In addition, there are many types of lakes useful for rainwater store. Some of these are made naturally, while many are man-made. The purpose is to retain water for use after monsoon.

3.3.1 Dam

The location of the dam is determined by considering the right catchment area/watershed area, at the right place. Water requirement, rainfall and watershed capacity are also taken into account. Water supply start after completion of the dam and development of all water distribution and utilization systems.

Dam to Water Treatment Plant/Water purification center

Water is first brought to the water treatment plant through dams using energy or using slope.

Canal: A canal is a channel constructed to carry water or to supply water from dam to the desire location.

Sub-canals: A sub-canal is a canal built to carry water or supply water to a farm by connecting it to a main canal.

3.3.2 Canal

During monsoons, water from brooklets (Ohol), runnels (Nale), rivulets (Odhe), streams and rivers is stored in the dam. As it flows over different land surfaces, it contains many kinds of impurities. Therefore, water from natural water sources is not always drinkable. The place where various processes are carried out to make the water drinkable which stored in the dam is called a water purification center/water treatment plant.

Water lifting station (उपादान/उपसा केंद्र).....

The construction which is done to take out water from rivers, streams, canals, ponds, reservoirs, etc. for purification is called water lifting station. Depending on the location of the water source, different methods have to be constructed for water lifting station. The method of water lifting station construction on the river is different from the method of water lifting station construction on the reservoir. Also the water lifting station on the canal is different. Water is discharged from the water lifting station tower through a tap in a small well. The water is pumped out of the well and sent for purification. Generally, the water treatment plant is far away from the water lifting station. So to send the water taken out of the water lifting station to the treatment plant, a water transmission system has to be considered. A pump or sloped ground (if possible) is used to carry the water. While choosing a site following factors are considered, (1) The properties of water should not be affected, (2) water distribution system should be simplified, (3) availability of electricity or similar energy, (4) safety from crises like flood, fire etc. Similarly, it is important to decide the type of pump to use. Although low cost is the main principle, it should also be seen that there should be reliable working pumps. Normally more pumps are kept than required. This means that even if there is a breakdown or malfunction, the water supply can be maintained without disturbing the work.

3.3.3 Upadaan

Water supply planning -

The following methods are adopted while planning the water supply of large cities. (1) Selecting the source of water by getting basic information about water supply. When choosing a source, it is important to check the quantity and properties of the water. (2) Estimating the future population and determining the total demand for water per person per day. This should include the demand for water for industry and firefighting. (3) Observing and measuring the entire city, its water source and its catchment area and taking notice of all landforms. (4) To think how to bring water from the place of origin to the place of purification. (5) Determining the purification process by checking the properties of the water and determining the locations and levels of the components of this process by making an illustrated plan. Arrangement for storage of water after purification and transport to storage tanks. (6) To plan for collection tanks and pipelines to be used for water distribution and to determine the pressure in it.

After considering more than one alternative plan for all the above factors, their cost is determined, and a plan that is least costly and acceptable is chosen. In this way, when the plan is ready, the technical inspection has to be done by the governmental department. If the scheme is very large, all of the above can be done by the public health department of the state government. The first phase water supply scheme is planned in such a way that a second and third phase can be added at any time. Therefore, if it becomes difficult to get the financial support required for the entire scheme at once, it can be increased as the finance is available.

Cities usually have to fetch water from far distances as they require more water. Mumbai has to fetch water from distant lakes like Tansa-Vaitarna etc.

3.3.5 Water tank

Cities that are close to the seashore (e.g., Mumbai, Chennai, Calcutta, etc.) no longer have a choice but to supply water by distilling seawater in case of water shortage. Currently, such cities have to rely on distant lakes. As these cities are ports, their population and industries are increasing. Therefore, more attention has to be paid to the water supply of such cities.

What is water purification ?

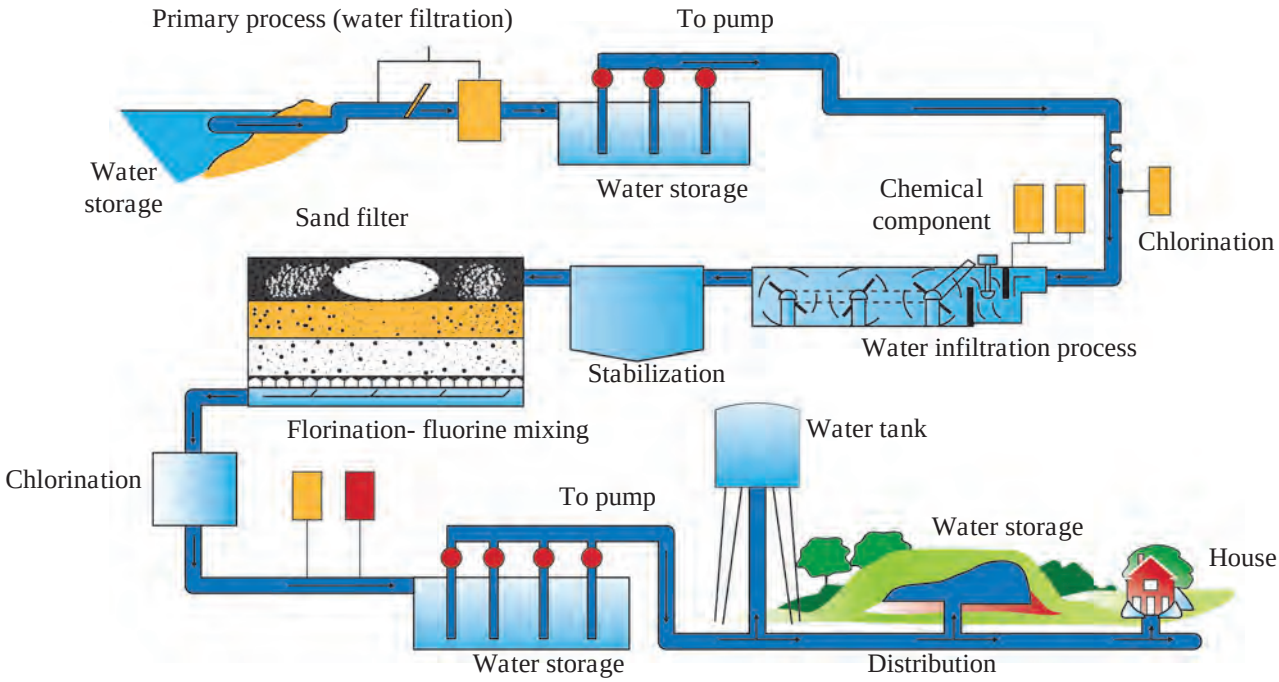
The extent to which the water is purified depends on its use. E.g. water for domestic use should be colorless, odorless, good in taste and hygienically safe. Water for industrial use should not contain substances that adversely affect the production system and spoil the finished product. Water used for agriculture should not contain substances that are harmful to soil and crops. Reservoir water contains a wide variety of minerals, carbon compounds, salts, larvae, microorganisms, viruses, various plants, etc. These substances are soluble or suspended (hanging). This can lead to contamination of water and spread of many diseases. Also, this water is used in various factories. To produce good products, water of certain quality is required. So water purification is very much essential. Chemicals in water have adverse effects on the body. Water with high levels of fluoride adversely affects the teeth of young children. For all these reasons, water is purified to make it as clean, healthy and drinkable as possible.

3.3.6 Water Purification centre

Process of water purification -

At the water treatment plant, it is churned after mixing chemicals. The water is filtered after the sludge settles down. To remove unwanted gases (CO_2, H_2S), substances that give water a foul and unpleasant taste, water volatile substances (eg. chloroform) and reduced compounds of iron and manganese in water, aeration is carried out. This process is mainly used to purify groundwater. This process is also used to increase the amount of dissolved oxygen in groundwater. Removal of carbon dioxide from water reduces the amount of metal corrosion in contact with water. It is then purified using disinfectant. The quality of purified water is tested by various tests. This pure water is stored in storage tanks mounted at high altitudes. These tanks are used to reach every house through main aqueduct, sub-aqueduct, plumbing.

As the rivers flow through the cities like Delhi, Ahmedabad, Kanpur, Solapur, Pune in the interior of the country, the source of water is the river and the dam on it, but due to the possibility of discharge of dirt and sewage in the same river, care must be taken while locating the water lifting station. It is also important to take proper care of disinfection. Such cities are also more likely to get water by digging wells.



3.3.7 Process of Water purification

Maintenance Management:

The responsibility of the water supply system is usually with the government till the completion of construction as per the cost of the scheme. But after completion of all the work it is handed over to the gram panchayat, municipality or corporation. In this system, it is more difficult to manage the water supply of a big city than a small village. The management includes maintenance of various machines and instruments used. Eg. repairing a broken faucet or leaking pipelines, delivering the water with the right amount of pressure everywhere. Every day it is necessary to examine the water coming from the source, the water coming out of the sedimentation tanks and filters, and the water available for direct drinking at all such stages, to ensure that the purification process is carried out properly. It is also important to check whether all the chemicals are being applied properly and whether the stock of chlorine and coagulants is adequate. Because it is important to be aware that, if there are not enough stocks, people's health is likely to be endangered until they are available. Also, at least one standby machine, pump etc.must be ready. They are used when a faulty device or pump is being repaired. It is the job of the chief manager to get the pump driver, chemist, mechanic, technician to do the job properly. There should be a laboratory near the water purification center in the city so that there is a possibility of experimenting with new types of discoveries or doing some new basic research.

Try this:

Visit the nearest water treatment plant/ water purification plant and observe the purification process.

Exercise

1. Describe the stages of water flow from the dam to the house
2. What is water purification?
3. Briefly describe the process of water purification.
4. How is the water purification project maintenance system works?