Lecture : 3 Fundamentals of Water Supply Network

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Fundamentals of Water Supply Network

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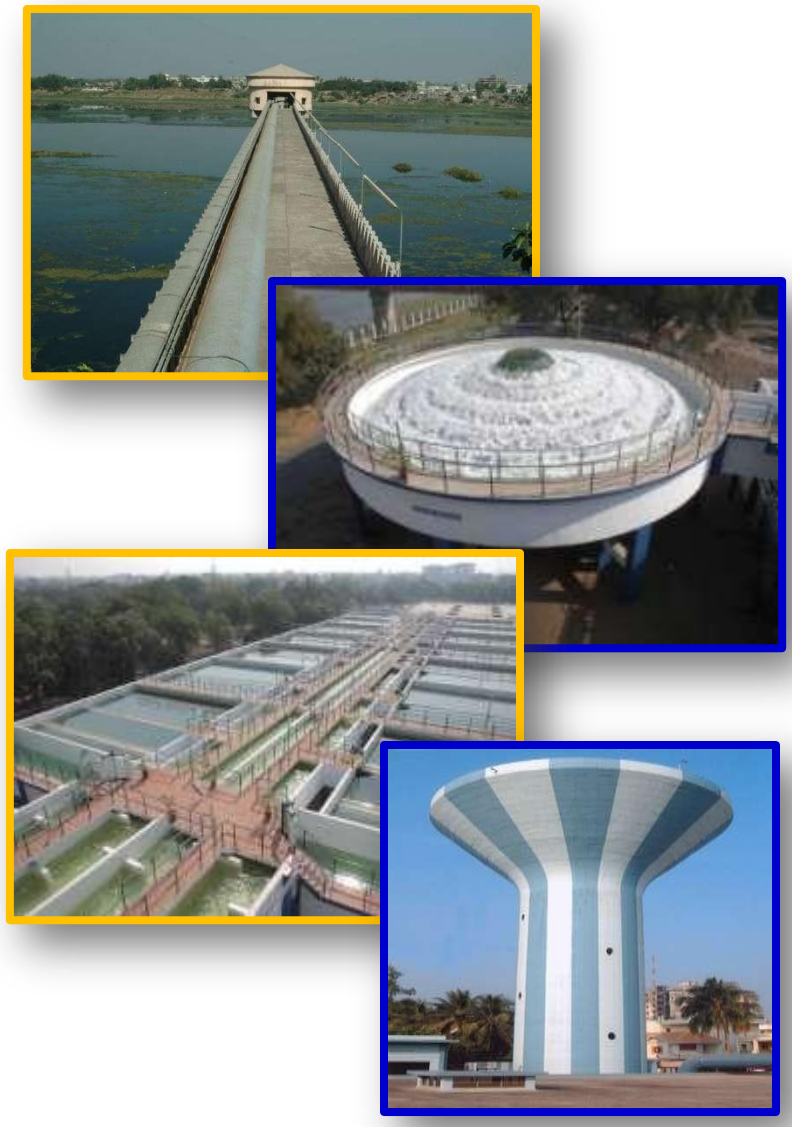
Definition

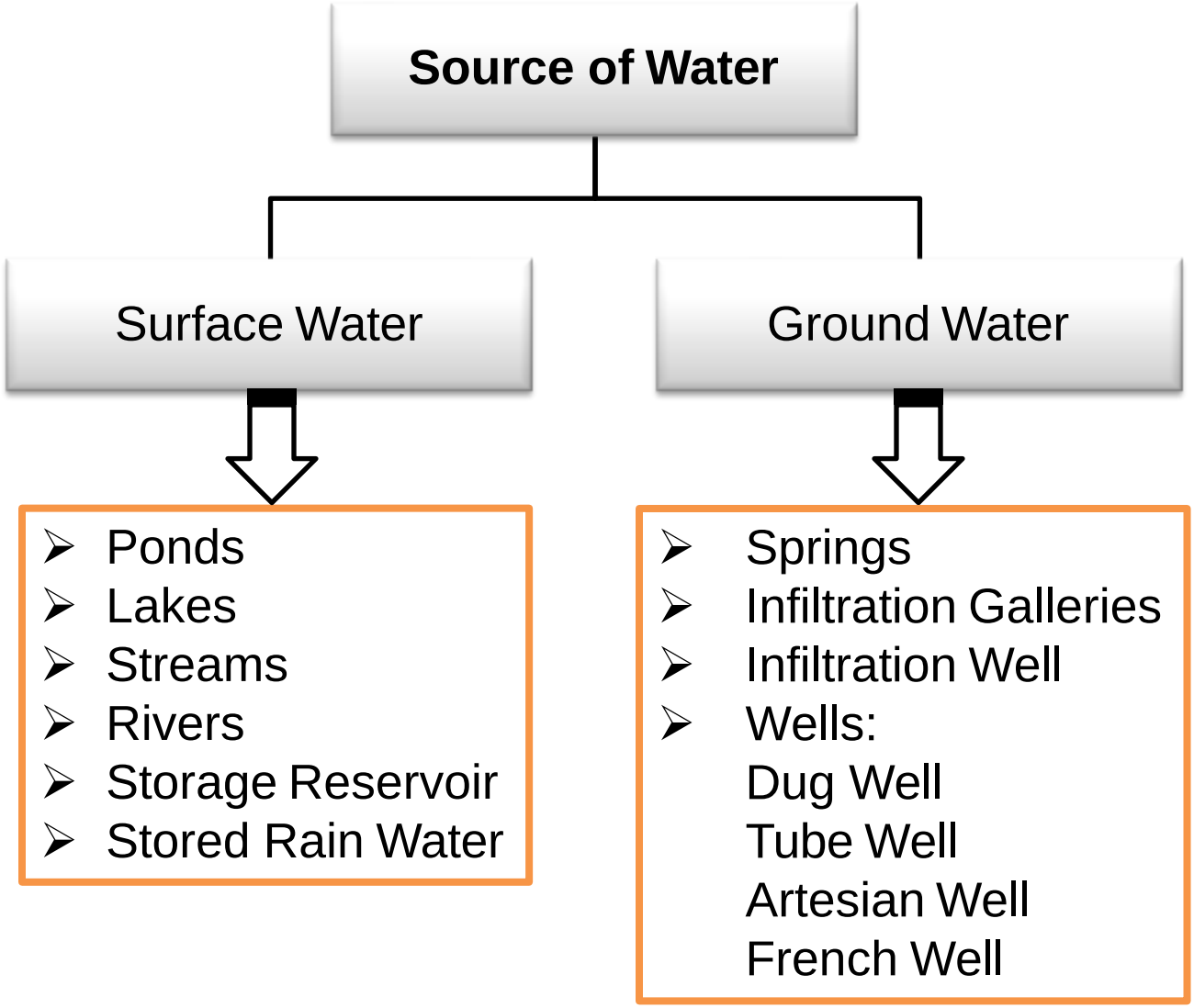
Water infrastructure can be defined as a stoke of facilities and installations needed to develop and manage water resources, including delivery, treatment, supply and distribution of water to its users as well as for the collection, removal, treatment and disposal of sewage and wastewater.



Public water supply scheme should meet the following requirements:

1. Ensured quality of water supply
2. Ensured sufficient quantity of supply
3. Ensured convenient and easy accessibility of water supply distribution
4. Ensured economic and financial viability of water supply

Sources of Water



Water Requirements

- The total consumption per day will be a product of total population and the consumption of water per person per day.
- Determination of total water requirement involves determination of:

1. Water Demand (Per day)

- Domestic or residential demand
- Industrial demand
- Institutional demand
- Fire demand
- Demand for public uses
- Water required to compensate losses in waste and thefts

2. Population Determination

- It is one of the most important factors in planning a water supply project, if the project has to serve the community for a certain design period.
- Design period of 20 to 40 years is selected.

Factors Affecting Rate of Demand

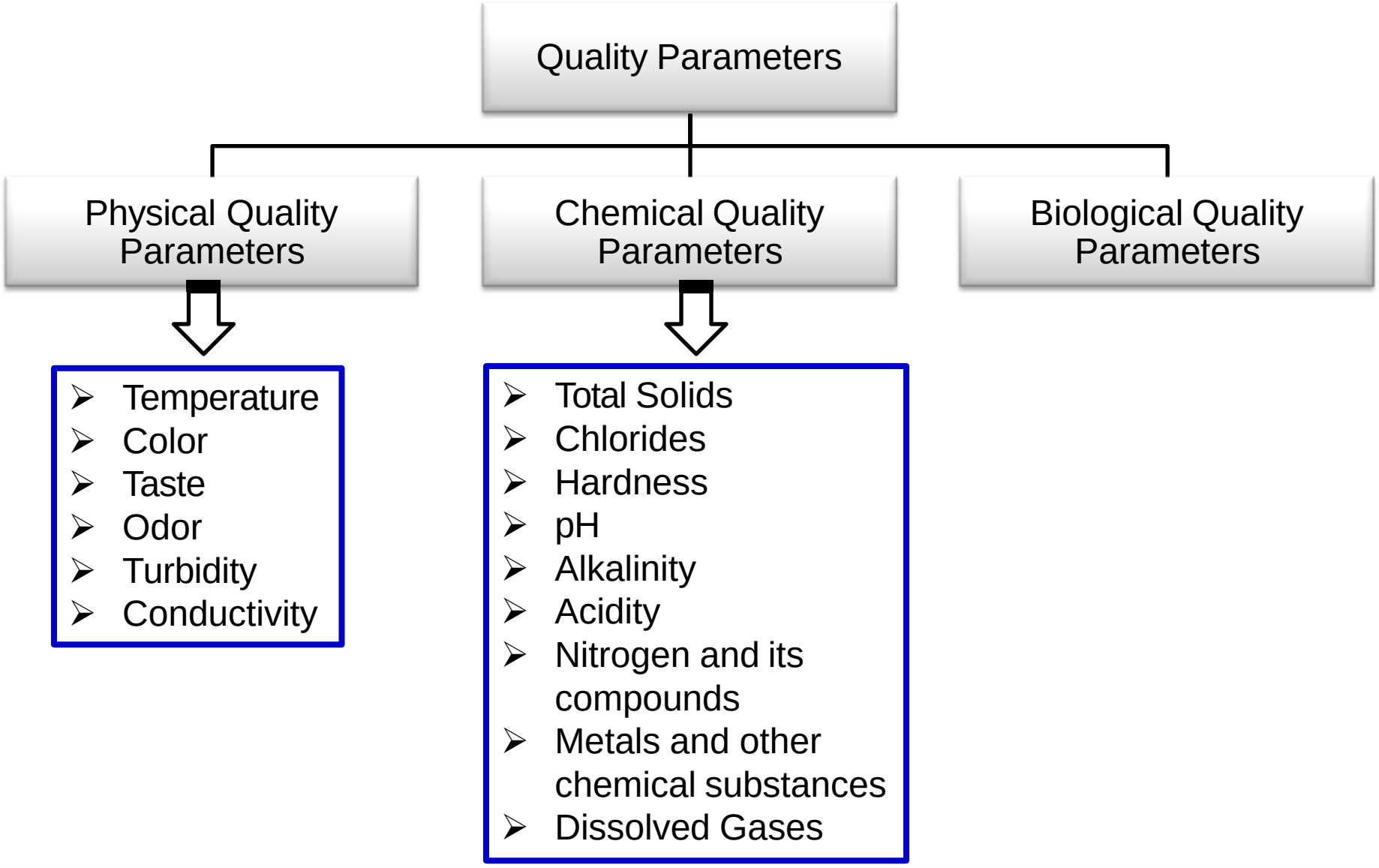
- Size and type of community
- Standard of living
- Climatic condition
- Quality of water
- Pressure in the supply
- Development of sewerage facilities
- Metering of water
- Cost of water
- System of water supply
- Industrial and commercial activities

Quality of Water

Potable water should have the following properties:

1. It should be colorless
2. It should be odorless
3. It should have good taste
4. It should not contain any harmful microorganisms or it should be safe microbiologically

Quality Parameters



Components of Water Supply Scheme

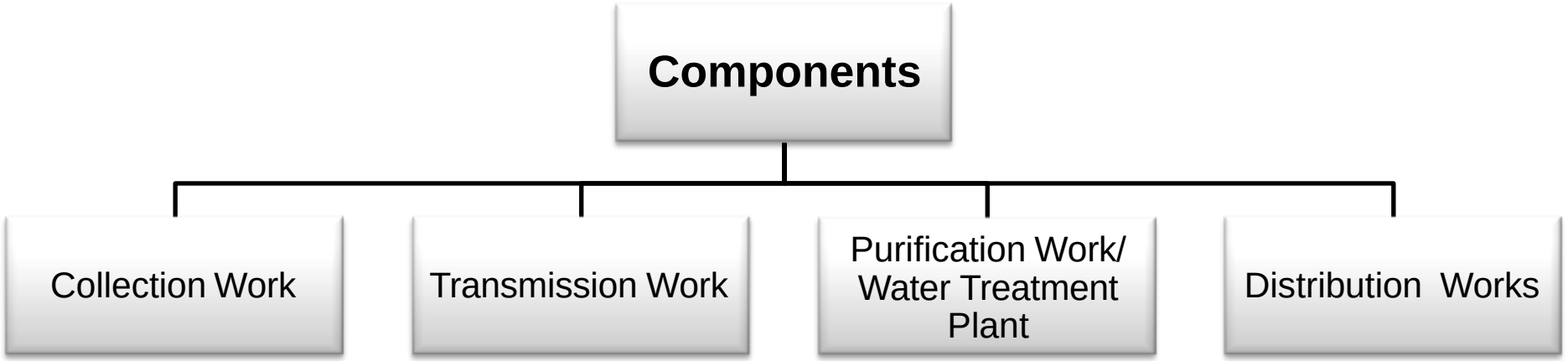
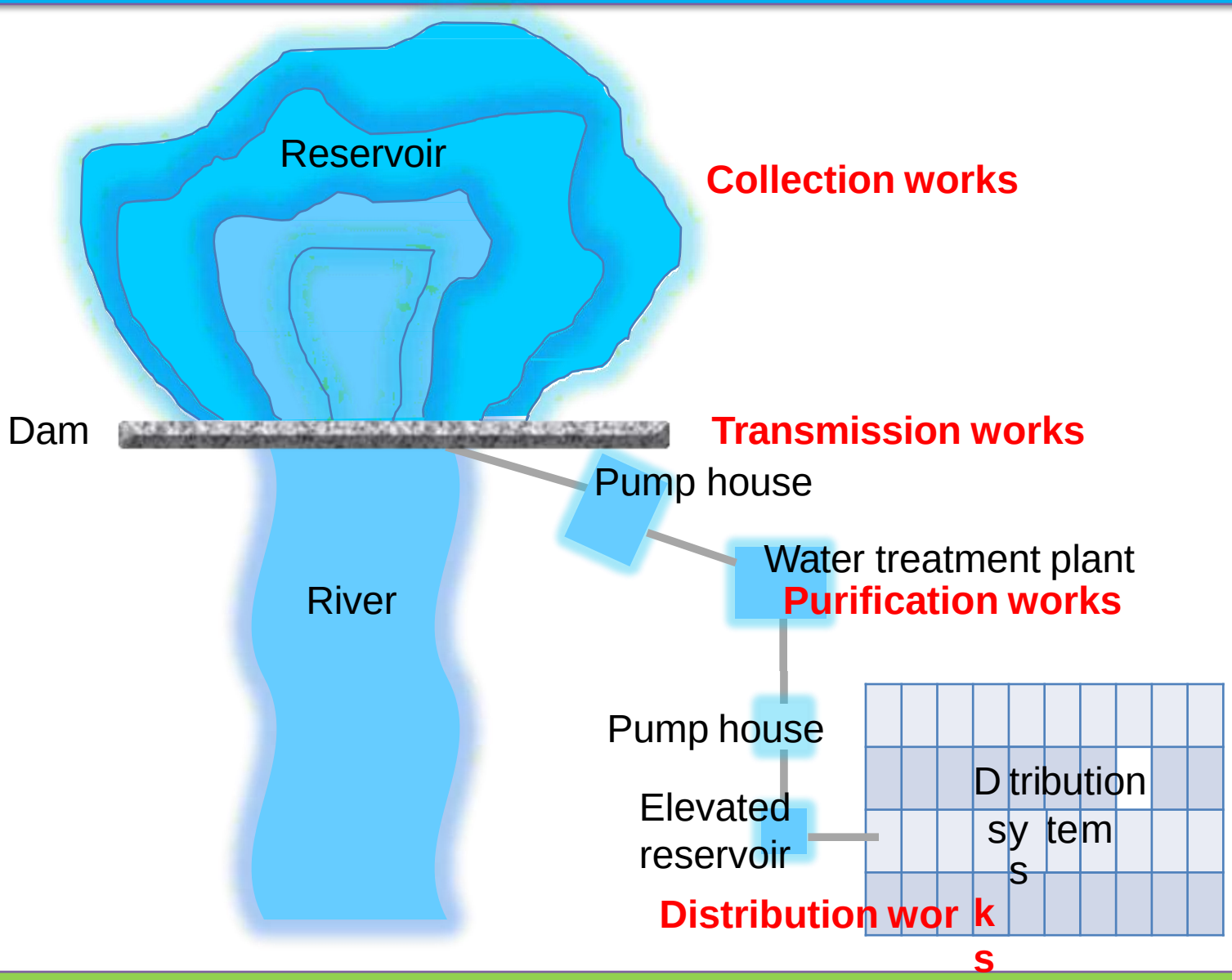
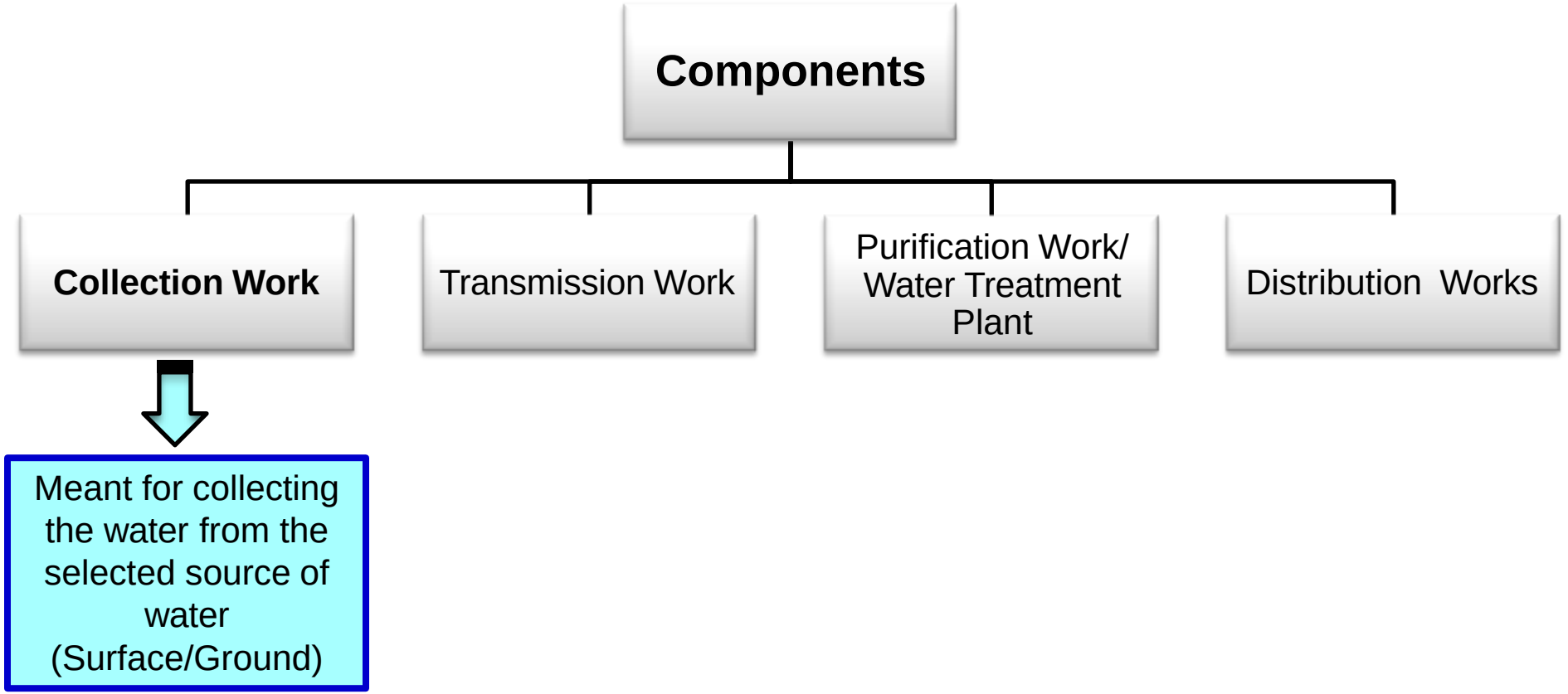


Diagram of Water Supply Scheme



Components of Water Supply Scheme



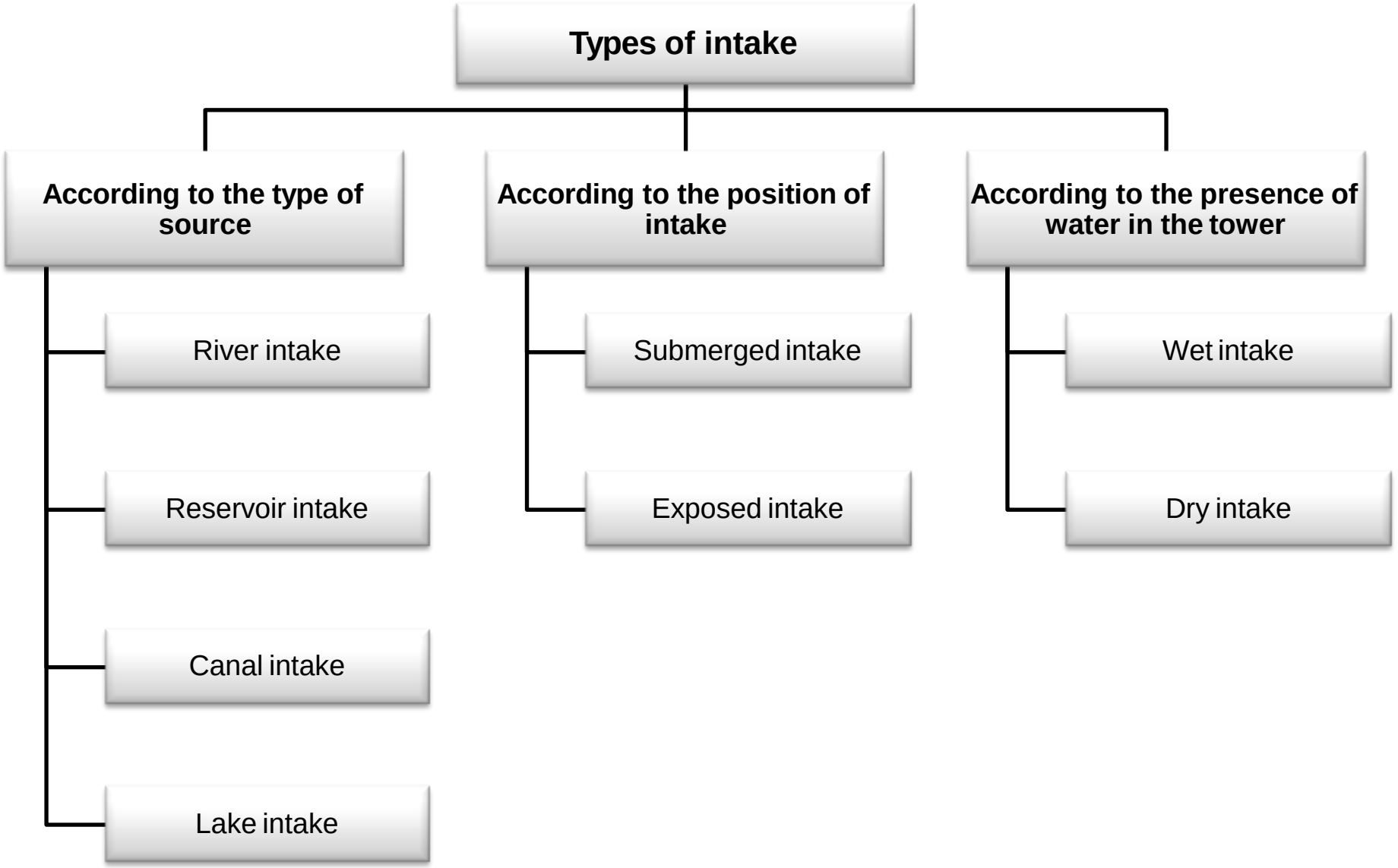
Collection of Water

Intake structure

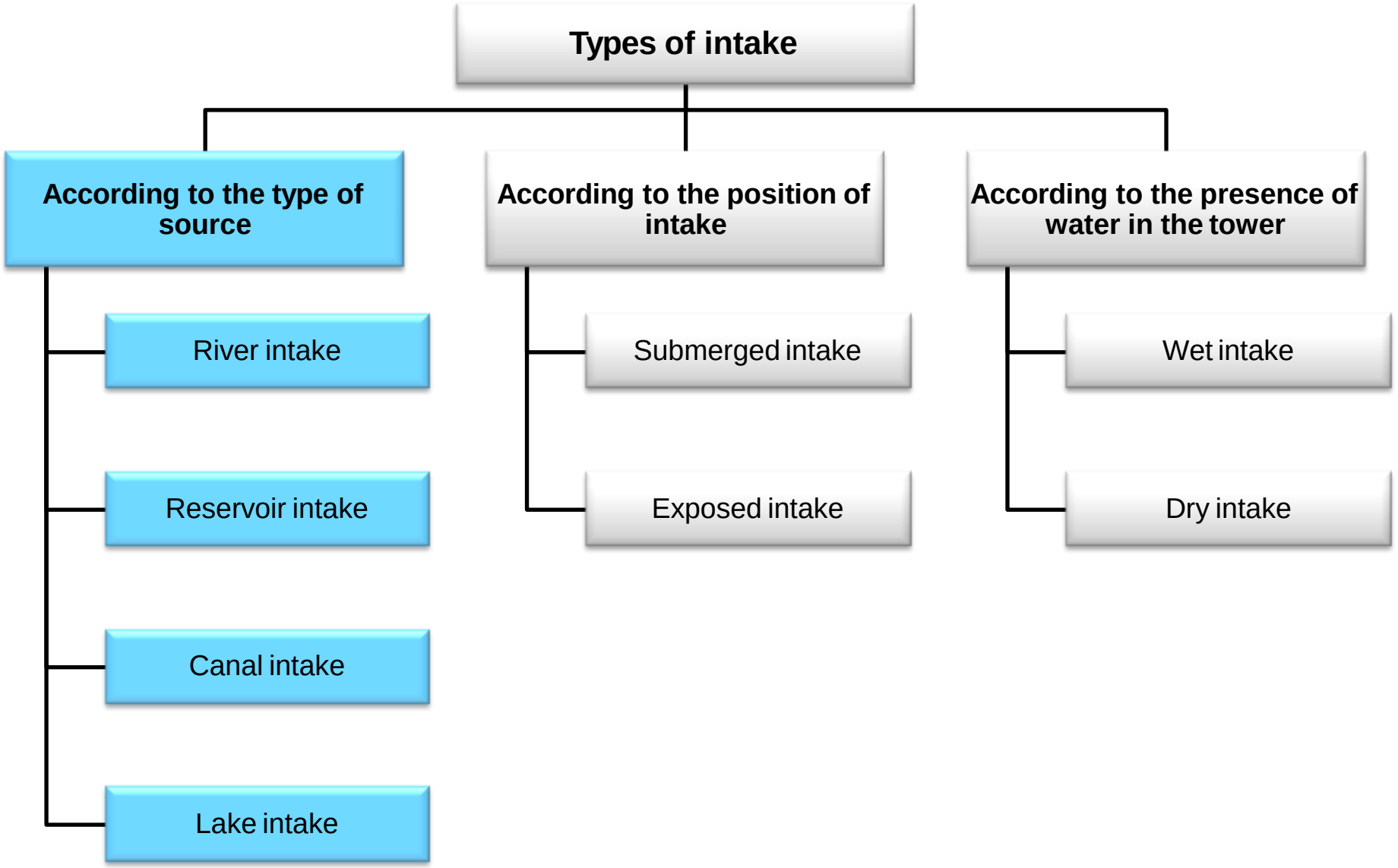
Function of intake:

To help in safely collecting or withdrawing water from the surface source over a predetermined pool levels and then to convey this water either by gravity or pumping to the treatment plant via intake conduits.

Types of Intakes



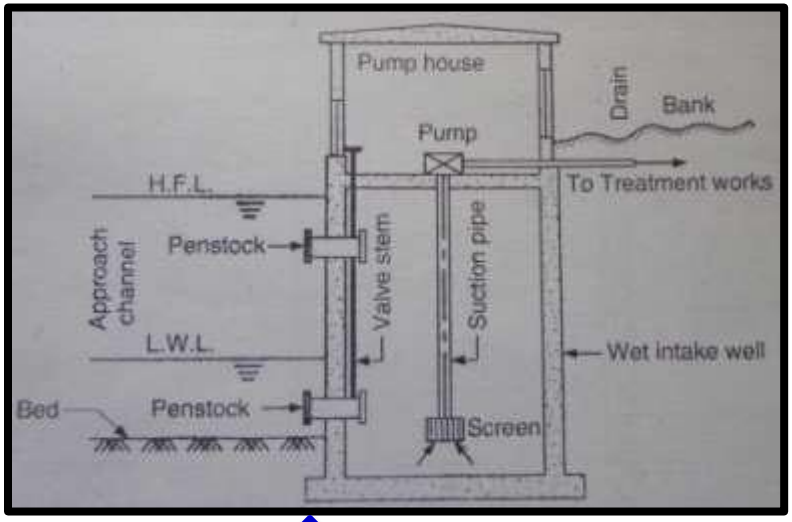
Types of Intakes



River Intake

According to the type of source

- **River Intake**
- Reservoir Intake
- Canal Intake
- Lake Intake



Location

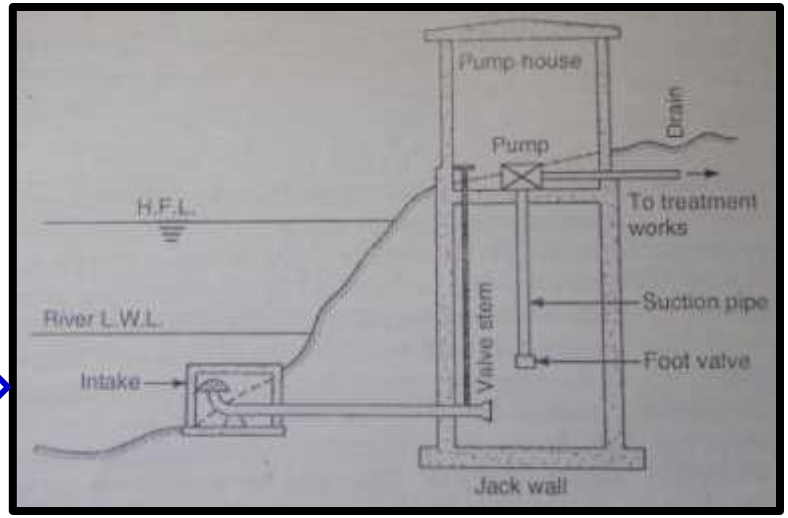
Upstream side of city to get comparatively better quality of water

Components

- Closed concrete or masonry well
- Pumps
- Rising main
- Entry ports with screens

Located sufficiently inside the river so that necessary demand of water can be met in all seasons of the year

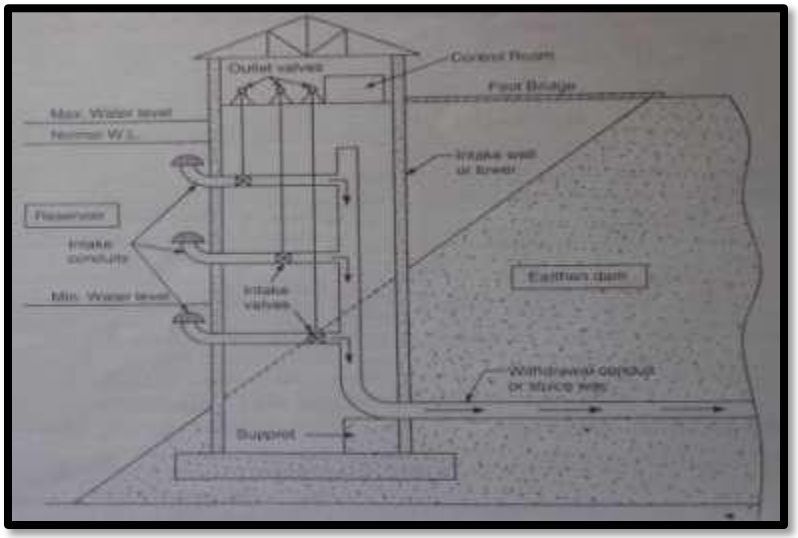
Located slightly away from the river bed when river bed is soft or unstable



Reservoir Intake

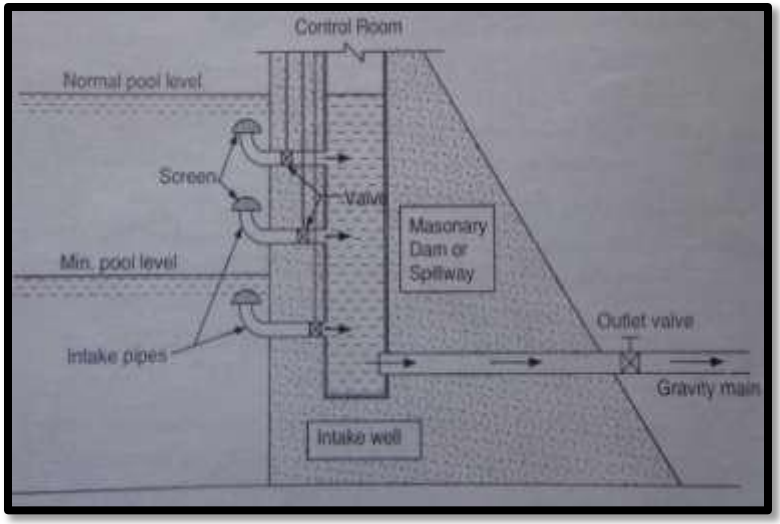
According to the type of source

- River Intake
- **Reservoir Intake**
- Canal Intake
- Lake Intake



- It is constructed when the flow in the river is not guaranteed throughout the year.
- A dam is constructed across the river to store the water in the reservoir so formed.

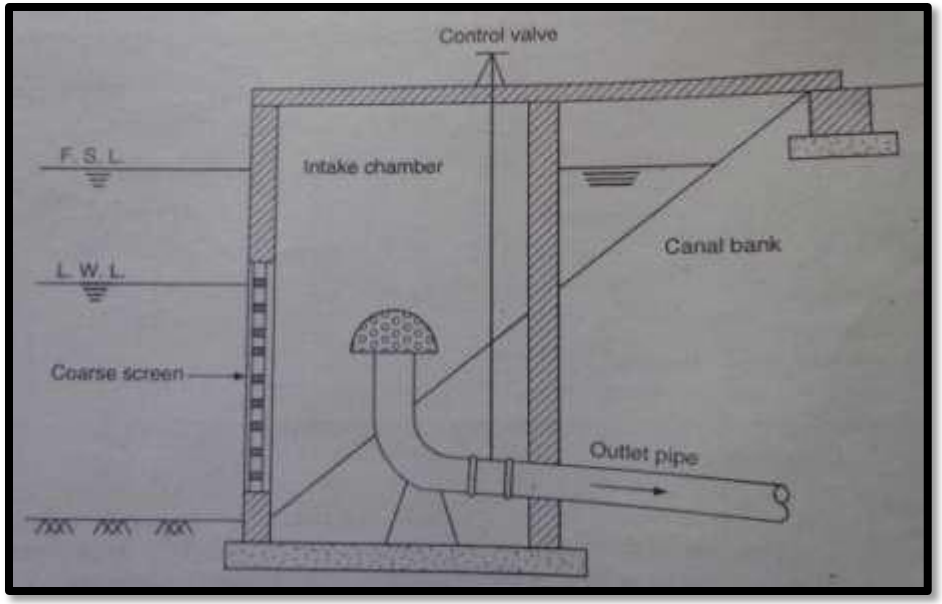
Intake towers are separately constructed in case of earthen dams but in gravity dam it is constructed inside the dam itself.



Canal Intake

According to the type of source

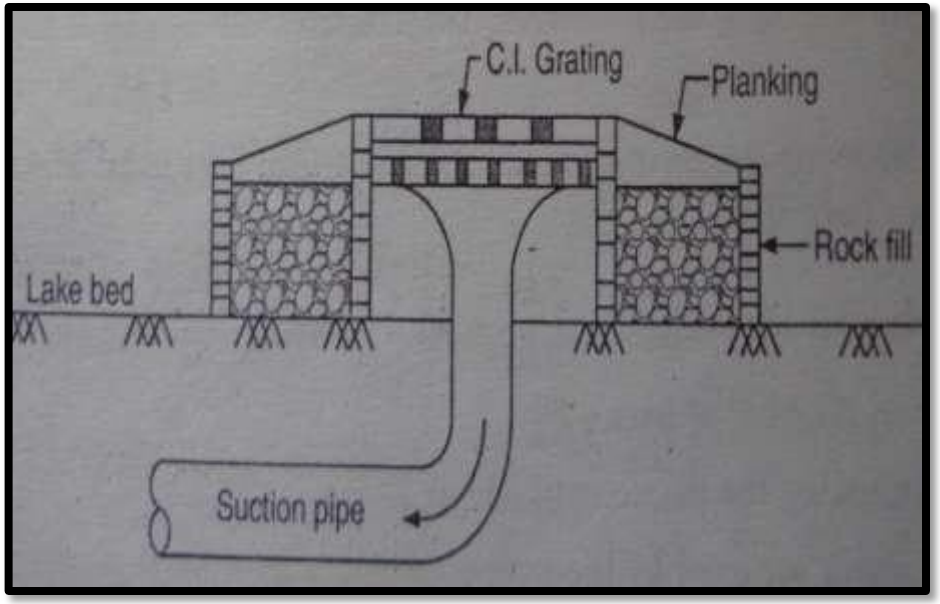
- River Intake
- Reservoir Intake
- **Canal Intake**
- Lake Intake



- For small town a nearby irrigation canal can be used as the source of water.
- The intake well is generally located in the bank of the canal.
- Canal should be lines on upstream and downstream side of the intake to prevent erosion of sides and bed of canal.

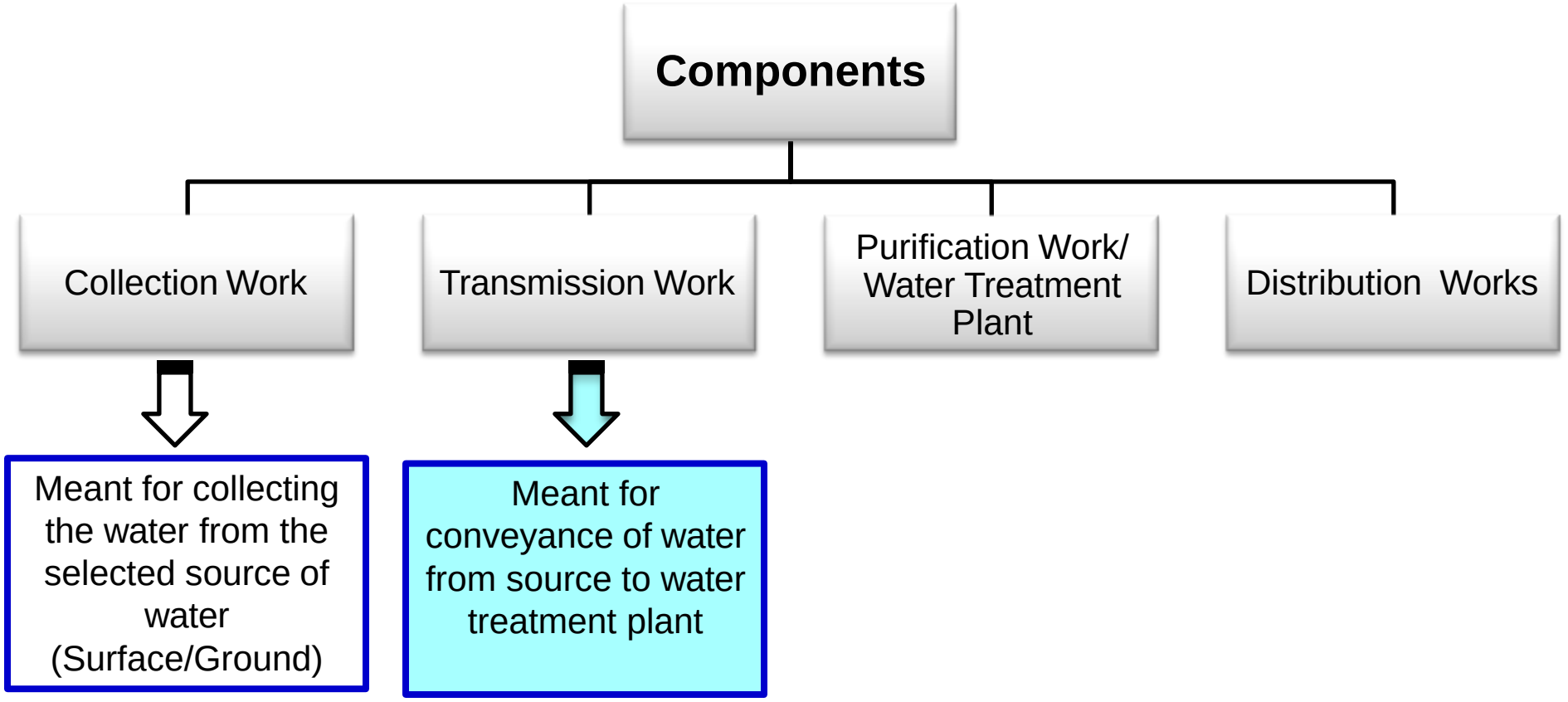
lake Intake

- **According to the type of source**
  - River Intake
  - Reservoir Intake
  - Canal Intake
  - **Lake Intake**



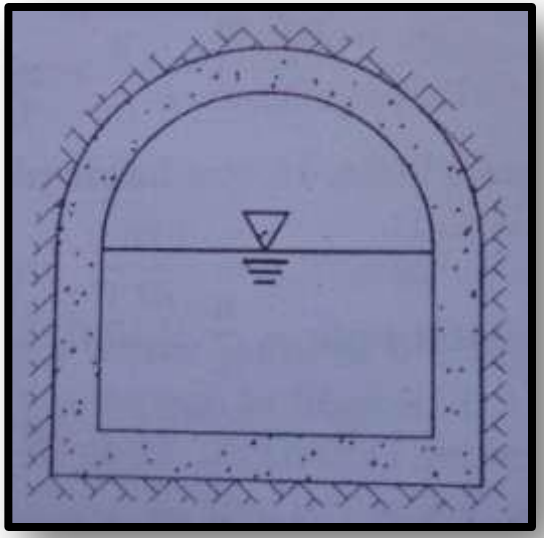
- It is submersible intake.
- These intakes are constructed in the bed of the lake below the low water level so as to draw water even in dry season.

Components of Water Supply Scheme

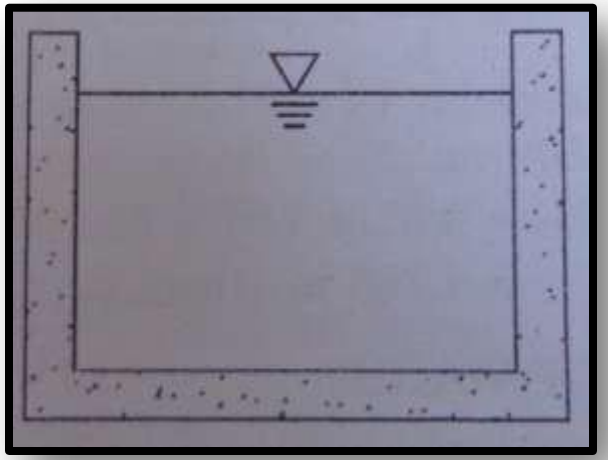


Transmission of Water

- Water is conveyed to the city by means of conduits.
- If the source is at higher elevation than the treatment plant, the water can flow under gravitational force.
- If the source of supply of water is river or reservoir and the town is situated at higher level, the water will have to be pumped and conveyed through pressure pump.
- Water can be conveyed from source to the treatment plant by open channels, aqueducts, tunnels, flumes, pipes.

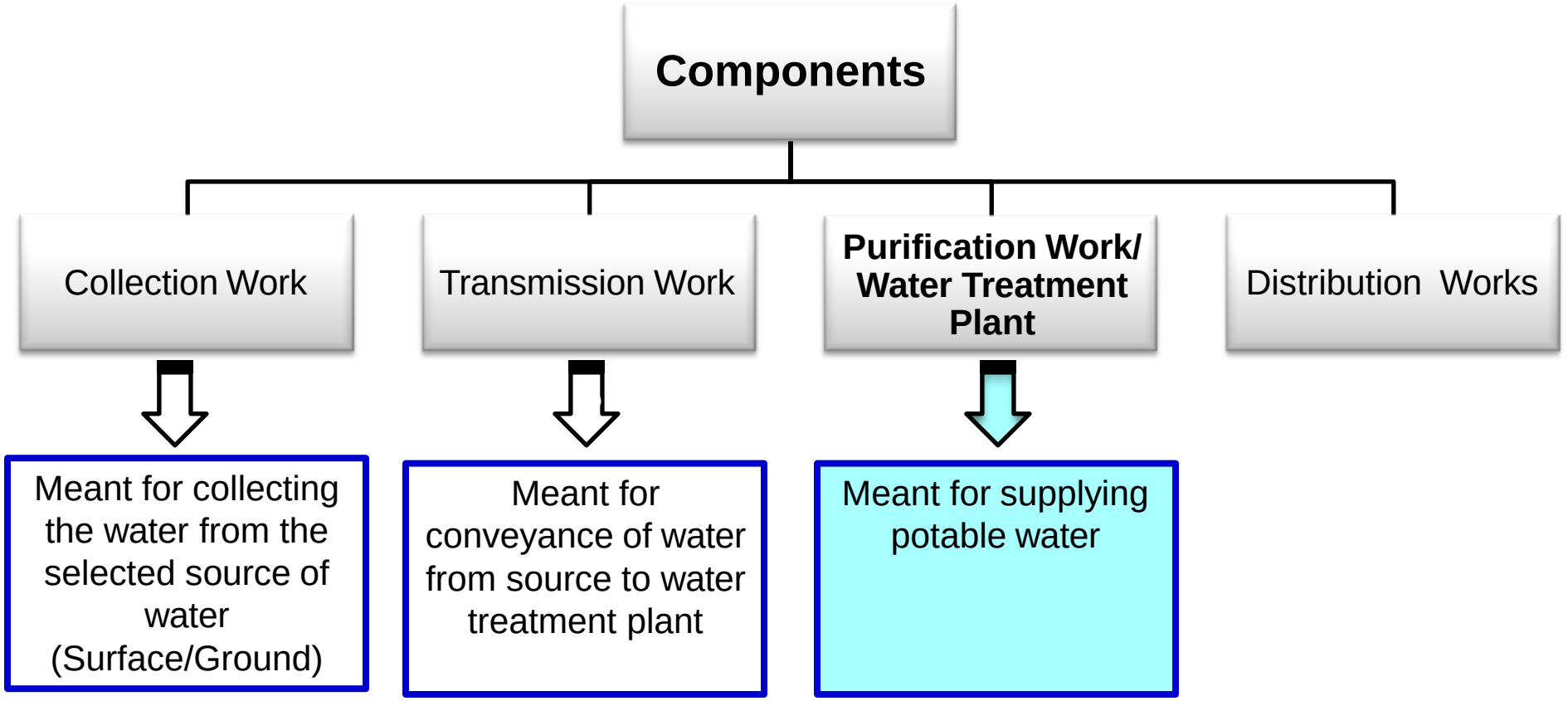


Aqueduct



Open channel

Components of Water Supply Scheme



Purification of Water

- The main aim of water treatment is to produce and maintain water that is hygienically safe, aesthetically attractive and potable in an economical manner.

- Water treatment processes are basically meant for removal of impurities of raw water and bringing the quality of water to the required standards.

Flow Diagram of Water Treatment Plant Process