# UNIT ⇒ 2

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## Distribution of Water :

Water distribution system are ordinarily designed to adequately satisfy the water requirement for a combination of domestic commercial, industrial and fire fighting purpose.

A good distribution system should satisfy the following requirments:

1) it should be capable of supplying water at consumer tap at reasonable pressure head.

2) should meet the fire demand

3) should maintain the degree of purity

4) Water should be available even during breakdown period

5) Intial cost as low as possible.

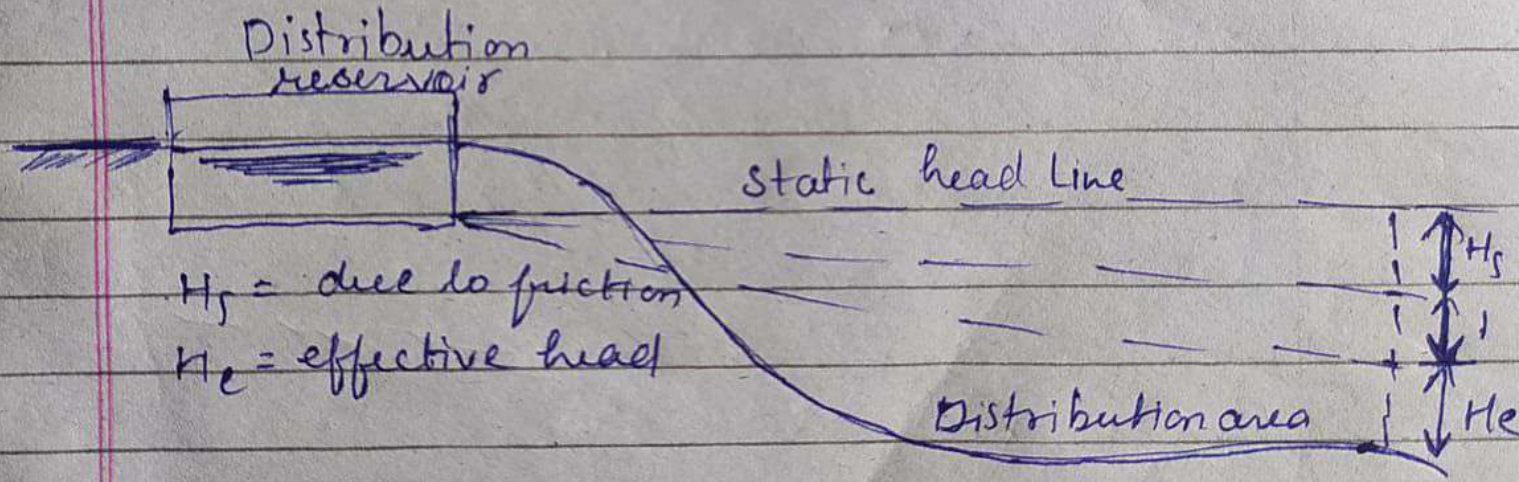
# Methods of distribution:

2) depends upon the topography of the area.

3) The following methods or system may be adopted for distribution:

1) gravity system
2) Combined gravity and pumping system
4) Pumping system.

## (1) Gravity System:




2) the source of water supply is so located with respect to the area of distribution that water is available with sufficient pressure at various points of the area

3) No pumping is normally required

4) water flows ~~etc~~ entirely under gravity.

# Combined Gravity and pumping System

=) most common system adopted in most of the cases.

=) The water purification work are located almost at the same level as the area of distribution.

=) to obtain sufficient distribution pressure filtered water is pumped into clear water reservoir (CWR).

=) CWR located either on a higher ground or elevated on a tower

=) water from elevated reservoir then flows under gravity.

(3) (Pressure) Pumping System:

⇒ water is pumped directly into the distribution system to achieve the required pressure.

➡ such a system is not desirable

⇒ double pumping is required

⇒ In case of power failure, the entire water distribution system of locality is disturbed

## PRESSURE In distribution Mains:

⇒ Adequate pressure should be available in distribution mains at all points

⇒ desired pressure depend upon following
(i) the height to which water is required to be supplied
(ii) fire fighting required
(iii) supply metered or not
(v) availability of funds.

(a) Residential districts:

upto 3 storeys : 2 kg/cm²
3 to 6 storeys : 2 - 4 kg/cm²
6 to 10 storeys : 4 - 5.5 kg/cm²
above 10 storeys : 5.5 to 7 kg/cm²

(b) Commerical districts : 5 kg/cm².

## SYSTEMS OF Water Supply:

### (1) Continuous system:

⇒ water available to the consumer for all 24 hours of a day.
⇒ water is not stagnant in the pipe at any instant hence fresh water is always available.

### (2) Intermittent System:

⇒ water is supplied to the consumer only during some fixed hours of the day.

4) 2-4 hour in morning & 2-4 hour in evening.

5) most common system adopted in India.

## STORAGE AND DISTRIBUTION RESERVOIR

1) storage and distribution reservoir are important unit in a modern distribution system.

=) Balancing storage reservoir in distribution system: The main and primary function of this is to meet the fluctuating rate of consumption with a constant rate of consumption with a constant rate of supply.

### Type of storage and distribution reservoirs:

1. Surface reservoirs
2. Elevated reservoirs
3. Stand pipes

i) Surface Reservoirs:-

=) These are made mostly of masonry or concrete.
=) Common practice is to line surface reservoirs with concrete, asphalt to check the leakage of water.
=) large size reservoirs may be built underground
=) constructed in two or more compartments so that one unit can be cleand while other units are in operation.
=) should be located at high points in distribution system
=) So, gravity supply can be done

ii) Elevate Reservoirs:

=) commonly known as overhead tank.
=) They may be constructed of stone masonry reinforced concrete or steel.
=) All elevated reservoir are invariably provided with Top covered, ladder and man-hole for inspection and cleaning purposes.

(iii) Standpipes:

=) constructed where surface reservoir would not provide sufficient head.

=) A standpipe is essentially a tall cylindrical tank

Location of distribution reservoirs:

=) distribution reservoirs should be located centrally or at least as near as possible to the zone that they serve.

=) They should be located on high ground or at sufficient elevation to maintain adequate pressure.

=) Central location of the reservoir will reduce friction losses in the distribut pipes

# CAPACITY of Distribution Reservoir:

storage capacity of distribution reservoir is based on the following 3 requirements:

(i) balancing or equalising reserve
(ii) breakdown reserve
(iii) Fire reserve

The national Board of fire Underwriters recommends that distributing reservoirs be made large enough to supply water for 10 hours in communities of more than 6000 people & 8, 6, and 4 in place where 4000, 2000, & 1000 people

The amount of fire reserve may be determined from the following expression:

$$R = [P - F]T$$

R = Reserve storage (liters)
F = Fire demand, liters/min
T = duration of fire, in minutes
P = reserve fire pumping capacity

⇒ McDonald has suggested the following expression for determining storage capacity of reservoirs:

$$R = aD + bD + \frac{10}{24}(D + f - P)$$

a & b = coefficients, the values of which may be taken as 0.2 and 0.1 Respectively.

D = Demand (mld)

When a storage or distribution reservoir is to be designed for the purpose of balancing or equalising the flow, its storage capacity can be determined by two methods:

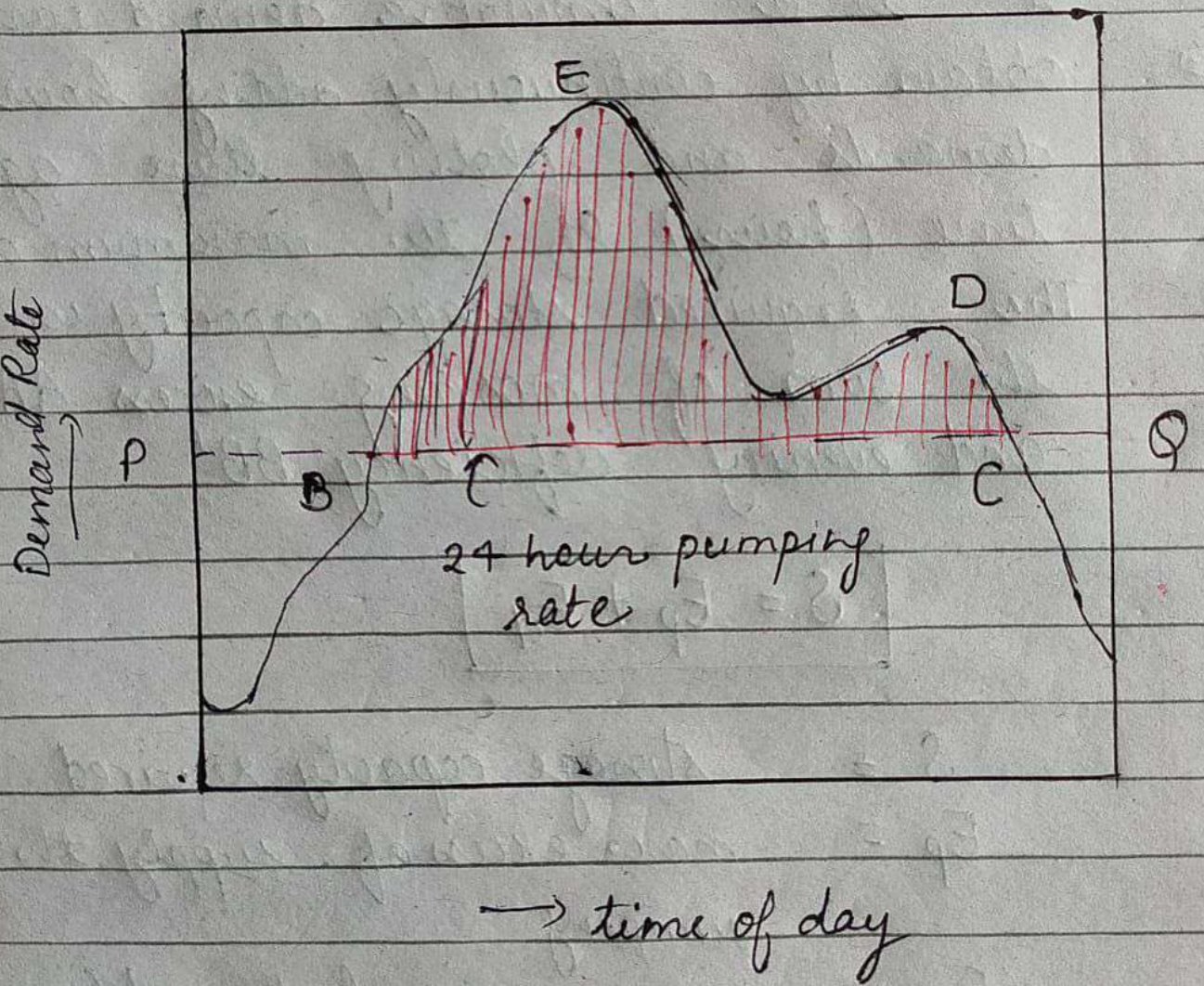
(a) Hydrograph Method
(b) Mass Curve Method.

## 2) HYDROGRAPH METHOD :

2) It is well know that hourly water demand rate is not constant throughout the day

2) demand more during morning and evening and less during the other part of the day.

2)




2) Required storage is then obtain by planimetering or determining in some other

manner the area b/w curve BEC and line PQ.

⇒ Area can be converted into unit of volume to yield the required storage in million litres.

## (b) Mass Curve Method:

⇒ It is a cumulative demand curve
⇒ obtain by continuously adding hourly demands and plotting these against time (hour) of the maximum day.
⇒ The required storage capacity will be the sum of morning excess AA' and evening deficiency BB'

$$\boxed{S = E_p + E_d}$$

$S$ = storage capacity required
$E_p$ = max. excess of supply through pumping
$E_d$ = max. excess of demand (max. deficiency)