Disinfection

Purpose:

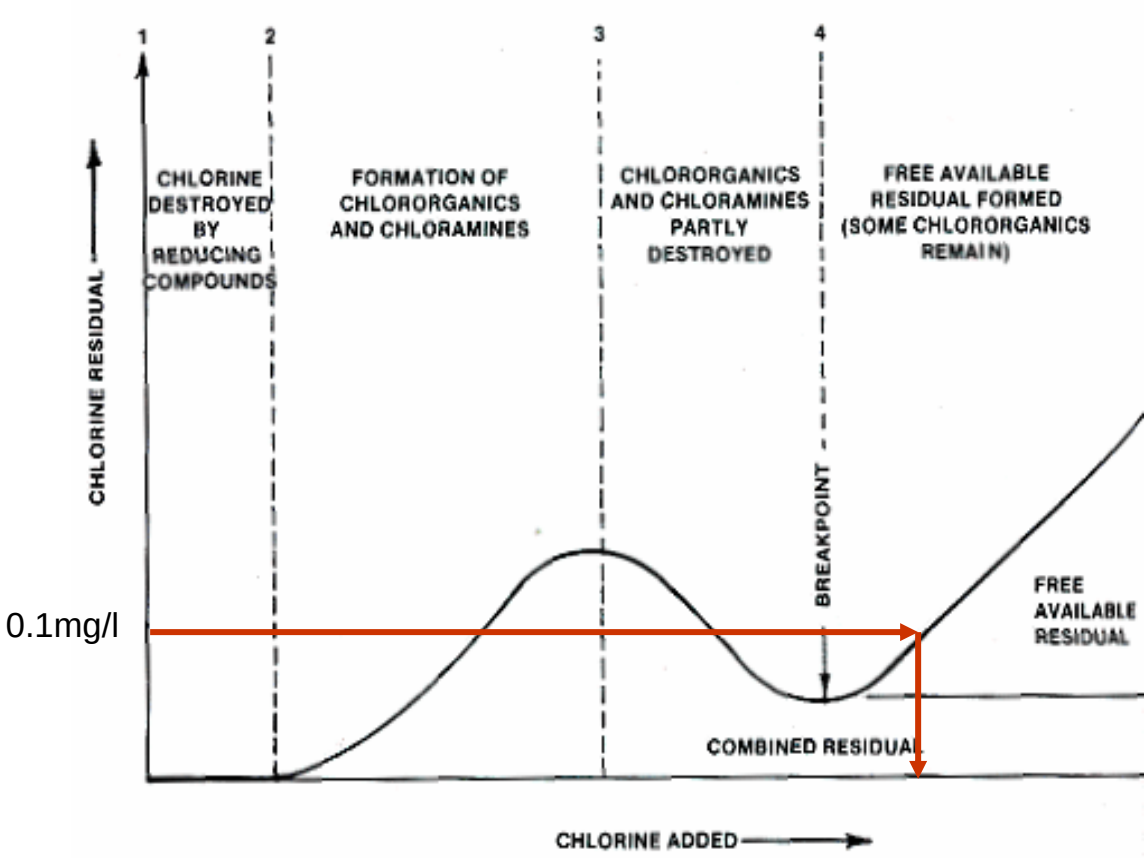
Destroy all bacteria.

Methods of disinfection:

1- Heat
2- Ultra violet
3- Chlorination

Factors affecting efficiency of chlorination:

- Temperature directly proportional
- Ph value inversely proportional
  More efficient at pH less than 7.
- Chlorine dose
  Chlorine dose 0.5 – 1 mg/l is required to give the residual from 0.1 – 0.3 mg/l.
- Adequate mixing
- Retention period (½ hr)



Injection by Chlorine

4- Ozone (0_3)
The ozone dose is 2 – 3 mg/l.

Advantages:

Ozone kills the bacteria faster than the chlorine

Disadvantages:

1- High cost
2- It disappeared after 10 minutes, so it doesn't has residual to protect the water networks thus chlorination is better than ozone.

Clear water reservoir (ground reservoir):

Purpose:

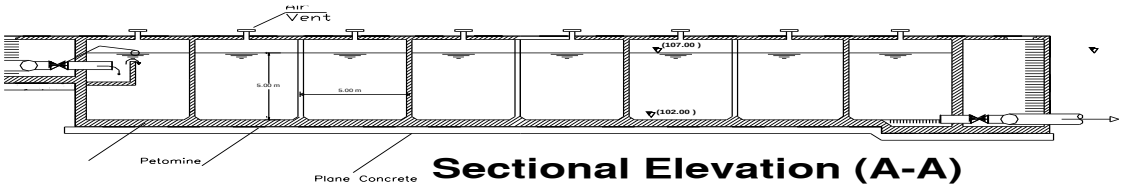
1- Cover the contact time for disinfection.
2- Cover the emergency requirement for 6 - 8 hr of Qd.
3- Cover the difference between max consumption daily and monthly through a day.
4- Cover 80% of fire demand (120 – 240 m3/ 10,000 capita).

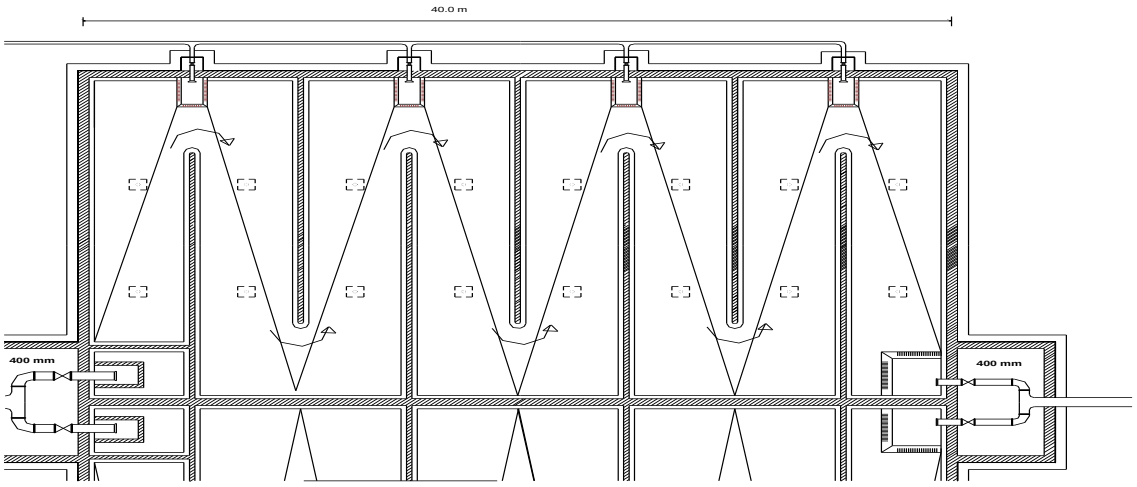
Design criteria:

1- Q_d = Qmax monthly
2- Volume = bigger of (V1, V2 ,V3) + V4
V1 = Qd x 1/2 hr for disinfection
V2 = (Qmax daily – Qmax monthly) x 24 hrs

V3 = Qd x 8 hrs
V4 = 4/5 (120 x pop/ 10,000)
3- No. of tanks ≥ 2
4- L ≤ 50 m and a number devisable by 5
5- B ≤ 50 m
6- d = 2.5 - 6.5

Size (m^3)	D (m)
2500	2.5 - 3.5
2600 - 13500	3.5 - 5
13600 – 20000	5 - 6.5





Clear water reservoir

Example:

For a city of population 75,000 capita and water consumption 200 l/c/d. It is required to design ground reservoir. The working hours are 20 hours.

Solution:

$$Q_{ave} = \frac{population \times q_{ave}}{1000}$$

$$Q_{ave} = \frac{75000 \times 200}{1000} = 15000 \quad m^3/d$$

$$Q_{\max monthly} = 1.5 \times Q_{ave}$$

$$Q_{\max monthly} = 1.5 \times 15000 = 22500 \quad m^3/d$$

$$Q_{\max daily} = 1.8 \times Q_{ave}$$

$$Q_{\max daily} = 1.8 \times 15000 = 27000 \quad m^3/d$$

Volume:

$$V1(for\ disinfiction) = Q_d \times 0.5\,hrs$$

$$V1(for\ disinfiction) = \frac{22500}{20} \times 0.5 = 562.5 \quad m^3$$

$$V2(for\ emergency) = Q_d \times 8\,hrs$$

$$V2(for\ emergency) = \frac{22500}{20} \times 8 = 9000 \quad m^3$$

$$V3(Q_{\max daily} - Q_{\max monthly}) = (27000 - 22500) \times 1day = 4500 \quad m^3$$

$$V4(\frac{4}{5}\ fire\ demand) = \frac{4}{5} \times 120 \times \frac{75000}{10000} = 720 \quad m^3$$

$$V = 9000 + 720 = 9720 \quad m^3$$

$$Take\ d = 4m \qquad , n = 2$$

$$Area = \frac{9720}{2 \times 4} = 1215 \quad m^2$$

$$L = 40\,m \qquad \rightarrow \quad B = 30.37 \approx 30\,m$$