Internal Assessment - III

3>

⇒ i> Lime required for alkality ($CaCO_3$)

Molecule weight of CaO = 40+16 = 56

Molecule weight of $CaCO_3$ = 40+12+3×16 = 100

∴ CaO required for 200 mg/l alkality

$$= 200 \times \frac{56}{100} = 112 \text{ mg/l} = 112 \text{ kg/ml}$$

ii) Lime required for $MgSO_4$

Molecule weight of $MgSO_4$ = 24+32+4×16 = 120

∴ CaO required for 75 mg/l of $MgSO_4$

$$= 75 \times \frac{56}{120} = 35 \text{ mg/l} = 35 \text{ kg/ml}$$

∴ Total lime required = 112+35 = 147 kg/ml

iii) Soda required for $MgSO_4$

Molecule weight of Soda = 2×23+12+3×16 = 106

Molecule weight of $MgSO_4$ = 24+32+4×16 = 120

∴ Soda required for 75 mg/l of $MgSO_4$

$$= \frac{106}{120} \times 75 = 66.25 \text{ mg/l} = 66.25 \text{ kg/ml}$$

∴ Total soda required = 47.75 + 66.25 = 114 Mg/ml

Amount of slaked lime required

Molecule weight of slaked lime $Ca(OH)_2$

$= 40 + 2 \times 16 + 2 \times 1 = 74$

Molecule weight of pure lime $(CaO) = 40 + 16 = 56$

∴ quantity of slaked lime required $= \frac{74}{56} \times 147 = 194.35$ Kg/ML

But the available slaked lime has purity of 85%. only

∴ Actual quantity of market available slaked lime

$= \frac{194.25}{0.85} = 228.5$ kg/ML

1> Chlorination

Chlorination is the addition of chlorine to kill the bacteria chlorination of very widely adopted in all developing countries for treatment of water for public supply.

Chlorine is available in gas, liquid or solid form.

* Advantages of chlorine

* Chlorine is manufactured easily by electrolytic of common salts (NaCl)

* Dosage can be controlled precisely

* can be easily detected by simple orthodidine test

* Doses required residue in water to neutralise recontamination later.

Precautions is using chlorine

1. Chlorine gas or liquid is highly corrosive and lethal to Inhale. Hence it is to be stored carefully in sealed container at a distance
2. If the water contains phenolic compounds, then is a reaction with chlorine can result in cancer causing substances.

Behaviour of chlorine in water:

When chlorine is dissolved in water forms hypo chlorous acid and hydro chloric acid

$$Cl_2 + H_2O \longrightarrow HOCl + HCl \text{ ----> (1)}$$

After some time hydrochlorous acid further Ionizes as follows

$$HOCl \longleftrightarrow H^+ + OCl^- \text{ ----> (2)}$$

The two prevailing species (HOCl) and (OCl^-) are called free available chlorine are responsible for the disinfection of water chlorine reacts with ammonia in water to form monochloramine, (NH_2Cl), dichloramine ($NHCl_2$) and trichloramine, (NCl_3) released and their distribution depends on the pH - value of water.

2) Fluoridation

When fluoride concentration in water supply is than an Optimum value of about 1mg/l the water proves harmful, as it may result in dental caries of children. It has been believed that during the formation of permanent teeth in children, scarcity of fluoride in consumed water, may lead to formation of weaker tooth enamel leading to early tooth decay. It had also been widely suggested that fluoride also proves beneficial to older people in reducing hardening of the arteries. and as fluoride stimulates bone formation. It is helpful in the treatment of osteoporosis. Due to such age old beliefs about the advantages of fluorides.

Defluoridation

Fluoride mainly enters the human body through drinking water 96-99% of it combines with bones, since fluoride has affinity for Calcium phosphate in the bones. Excess intake of fluoride can lead to dental fluorosis, skeletal fluorosis & non-skeletal fluorosis. Dental fluorosis is characterised by discoloured, blemished chalky teeth white teeth. Skeletal fluorosis leads to severe and permanent bone and joint deformation. Non-skeletal fluorosis lead to gastro-intestinal problems and neurological disorders. Fluoride can damage a foetus, and adversely affect IQ of children. Inspite of all the symptoms, fluorosis commonly remains undiagnosed for a long time.

4>

⇒ Average daily water demand

= Population × per capita demand

= 20,000 × 150 l

= 30,000,00 l = 3×10^6 l

∴ amount of chlorine required daily

$= 0.3 \times \frac{mg}{l} \times 3 \times 10^6 l$

$= 0.9 \times 10^6$ mg

= 0.9 kg

Since the chlorine content in bleaching powder is 30%. (meaning 30 kg of chlorine is contained in 100 kg of bleaching powder)

∴ Amount of bleaching powder required daily

$= \frac{0.9 \times 100}{30} = 3$ kg

∴ Annual consumption of bleaching powder

= 3 × 365

= 1095 kg = 1.095 tonnes.

5) Different pipes materials used in water supply

1) Steel pipes

Advantage: No of joining are less because there are available in long length.

* The pipe are cheap in first cost.

disadvantages

* Maintainance cost is high

* The pipes are likely to rusted by acidic or alkaline water.

2) A.C pipes

Advantages

* The inside surface of pipes are very smooth.

* The joing of pipes is very good and flexible

* The pipes are anticorrosive and cheap in cost

disdavantages

* The pipes are brittle and therefore handling is difficult.

* The pipes are not durable.

* The pipe cannot laid in exposed places.

3) R.C.C. pipes

Advantages

* These are pipes most durable with usual life of about 75 years
* Maintenance cost is less.
* Inside surface of pipes can made smooth.

disadvantage

* Transportations is difficult repair work is difficult.
* Initial cost is high.
* These pipes are effected by acids, alkalies and salty water.

4> prestressed concrete pipes

Advantages

* The inside surface of pipes can be made smooth.
* Maintance cost is less.
* The pipes are durable with life period 75 years.
* No danger is rusting.

Disadvantages

* The pipes are heavy and difficult to transport.
* Repairs of these pipes are difficult
* The pipes are likely to crack during transport and handling operations.

5> Galvanished Iron pipes

Advantages

* The pipes are cheap
* Light in weight and easy to handle
* The pipes are easy to join.

disadvantages

* The pipes are affected by acidic and or alkaline waters.
* The useful life of pipes is short about 7 to 10 years.