Water Demand Calculation

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Objective

- The water supply is one of the most essential facilities for the industrial village. To design the water supply facility we need to know the water demand first.
- The Water Demand calculation is based on population estimation and daily goods production.
- The water demand influences decisions regarding water well design, pumping schedule and supply system.
- Water demands are calculated using appropriate assumptions and suitable peak factors.

Classification of Water Demand

Water requirement can be classified as:

- Residential water demand
- Industrial water demand
- Administrative water demand
- Water demand for common services
- Water demand for fire fighting

- For calculating the water demand we need the following information,

☐ The present population for all the zones

☐ The design period of the industrial village

☐ The growth rates and the future populations

☐ The water requirement for each zone

Assumptions:

Peak factor for different zones:

- Residential Zone = 2.5
- Commercial Zone = 2 ~ 4 (Different values for different facilities are assumed)
- Industrial Zone = 2.1
- Fire Fighting = 1

Water Demand Calculation for the Residential Area:

Formula:

Water Demand at a Certain Time = Population at that time* Per Capita Consumption*time factor

- Per capita consumption = 200 lpcd
- Time factor = 24/24 = 1
- Peak Factor = 2.5
- Present Population = 70
- Present water demand = 200*70*1 =14000 lpd
- Present peak water demand = 200*70*1*2.5 =35000 lpd

Water Demand Calculation for the Residential Area:

- Population after 10 years= 76
- Population after 20 years= 81
- Future water demand (after 10 years) =200*76*1 = 15200 lpd
- Future peak water demand (after 10 years) =200*76*1*2.5 = 38000 lpd
- Future water demand (after 20 years) = 200*81*1= 16200 lpd
- Future peak water demand (after 20 years) = 200*81*1*2.5 = 40500 lpd

Water Demand Calculation for the Commercial Area:

- **Formula:**

Water Demand at a Certain Time = Population at that time* Per Capita Consumption* Time Factor

For School:

- Occupancy Type = B1
- Present Population = 600
- Per capita consumption = 70 lpcd
- Time Factor = 24/8 = 3
- Peak Factor= 3.5
- Present water demand= 600*70*3 = 126000 lpd
- Present peak water demand= 600*70*3*3.5 = 441000 lpd

Water Demand Calculation for the Industrial Area:

- **Type-1: Personal Consumption**

Water Demand at a Certain Time = Population at that time* Per Capita Consumption* Time Factor

- **For Unit-1:**
- Present Population = 36
- Occupancy Type = G1
- Per Capita Consumption= 25 lpcd
- Time factor= 24/24 =1
- Peak Factor= 2.1
- Present water demand = 36*25*1 =900 lpd
- Present peak water demand = 36*25*1*2.1 =1890 lpd

Water Demand Calculation for the Industrial Area:

- Population after 10 years= 43
- Population after 20 years= 50
- Future water demand (after 10 years) =43*25 = 1075 lpd
- Future peak water demand (after 10 years) =43*25*2.1 = 2258 lpd
- Future water demand (after 20 years) =50*25*2.1 = 1250 lpd
- Future peak water demand (after 20 years) = 50*25*2.1 = 2625 lpd

For Production Purpose:

For per day finished product:

- Area of finished Product per day = 50000 sq. ft.
- Water Required Per 1000 sq. ft. Finished Product =3000 gal
- Time factor = 24/24 (2 shifts) = 1
- Present Water Demand (gal/day) = (50000/1000) * 3000

  = 150000 gal/day *3.785 = 567750lpd
- Assuming peak factor = 2.1
- Total Present water demand = 2.1 * 567750 = 1192275 lpd

Fire Fighting Water Demand

For Water Demand for Fire Fighting:

- Diameter of nozzle of hydrant = 3 inch
- Velocity = 3 fps
- Flow occurs for 30 minutes
- Fire incident occurs once in a day.
- Number of hydrants working at a time = 2

Fire Fighting Water Demand

- Q = A*V (A = Area, V = Velocity & T = Time)
- Total volume of water flowing through one hydrant = Q*t

  = A*V*t

  = 265.07 ft^3

- Total number of fire hydrants = 2
- Total volume of water required for firefighting = 2 * 265.07 ft^3

  = 530.14 * 28.317 liters

  = 15012 liters

THANK YOU