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Sanitary System Sewer Design Formulas

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List of 10 Sanitary System Sewer Design Formulas

Sanitary System Sewer Design

1) Fire Demand for Cities of Less than 200,000 Population

Open Calculator

fx $$q = 1020 \cdot P^{0.5} \cdot \left(1 - 0.01 \cdot \left(P^{0.5}\right)\right)$$

ex $$10962.4\text{L/min} = 1020 \cdot (150)^{0.5} \cdot \left(1 - 0.01 \cdot \left((150)^{0.5}\right)\right)$$

2) Flow Rate through Pipe using Manning Formula

Open Calculator

fx $$W = C_f \cdot \frac{(i)^1}{2}$$

ex $$19.6\text{m}^3/\text{s} = 20 \cdot \frac{(1.96)^1}{2}$$

3) Infiltration given Total Infiltration to Sanitary Sewer

Open Calculator

fx $$I = \frac{F}{L}$$

ex $$30\text{m}^2/\text{s} = \frac{90\text{m}^3/\text{s}}{3\text{m}}$$

4) Manning's Formula for Conveyance Factor given Flow Rate through Pipe

Open Calculator

$$C_f = \frac{W}{\sqrt{i}}$$

$$20 = \frac{28\text{m}^3/\text{s}}{\sqrt{1.96}}$$

5) Manning's Formula for Pipe Slope given Flow Rate through Pipe

Open Calculator

$$i = \left(\frac{W}{C_f}\right)^2$$

$$1.96 = \left(\frac{28\text{m}^3/\text{s}}{20}\right)^2$$

6) Population Density given Sanitary Sewer System Flow Rate

Open Calculator

$$P_d = \frac{SS_{fr}}{A \cdot Q}$$

$$23.76238\text{Hundred/km}^2 = \frac{1.2\text{L/s}}{50\text{m}^2 \cdot 1.01\text{m}^3/\text{s}}$$

7) Quantity of Sewage Produced Per Day given Sanitary Sewer System Flow Rate

Open Calculator

$$Q = \frac{SS_{fr}}{A \cdot P_d}$$

$$1.010101\text{m}^3/\text{s} = \frac{1.2\text{L}/\text{s}}{50\text{m}^2 \cdot 23.76\text{Hundred}/\text{km}^2}$$

8) Sanitary Sewer System Flow Rate

Open Calculator

$$SS_{fr} = A \cdot P_d \cdot Q$$

$$1.19988\text{L}/\text{s} = 50\text{m}^2 \cdot 23.76\text{Hundred}/\text{km}^2 \cdot 1.01\text{m}^3/\text{s}$$

9) Sewer System Length given Total Infiltration to Sanitary Sewer

Open Calculator

$$L = \frac{I}{F}$$

$$0.333333\text{m} = \frac{30\text{m}^2/\text{s}}{90\text{m}^3/\text{s}}$$

10) Total Infiltration to Sanitary Sewer

Open Calculator

$$F = I \cdot L$$

$$90\text{m}^3/\text{s} = 30\text{m}^2/\text{s} \cdot 3\text{m}$$

Variables Used

- **A** Cross Sectional Area *(Square Meter)*
- **C_f** Conveyance Factor
- **F** Actual Infiltration *(Cubic Meter per Second)*
- **i** Hydraulic Gradient
- **I** Infiltration *(Square Meter per Second)*
- **L** Length of a Sanitary Sewer *(Meter)*
- **P** Population in Thousands
- **P_d** Population Density of Area *(Hundred per Square Kilometer)*
- **q** Fire Demand *(Liter per minute)*
- **Q** Discharge *(Cubic Meter per Second)*
- **SS_{fr}** Sanitary System Sewer Flow Rate *(Liter per Second)*
- **W** Waste Water Flow *(Cubic Meter per Second)*

Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Volumetric Flow Rate** in Liter per minute (L/min), Cubic Meter per Second (m³/s), Liter per Second (L/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m²/s)
  Kinematic Viscosity Unit Conversion
- Measurement: **Population Density** in Hundred per Square Kilometer (Hundred/km²)
  Population Density Unit Conversion

Check other formula lists

- **Design of a Chlorination System for Wastewater Disinfection Formulas**
- **Design of a Circular Settling Tank Formulas**
- **Estimating the Design Sewage Discharge Formulas**
- **Population Forecast Method Formulas**
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