Important Sanitary System Sewer Design Formulas PDF

Formulas
Examples
with Units

List of 10
Important Sanitary System Sewer Design Formulas

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

Evaluate Formula ➦

Formula

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

Example with Units

$$10962.3977 \, \text{L/min} = 1020 \cdot 150^{0.5} \cdot \left(1 - 0.01 \cdot \left(150^{0.5} \right) \right)$$

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2) Flow Rate through Pipe using Manning Formula Formula ➦

Evaluate Formula ➦

Formula

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

Example with Units

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

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3) Infiltration given Total Infiltration to Sanitary Sewer Formula ➦

Evaluate Formula ➦

Formula

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

Example with Units

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

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

Evaluate Formula ➦

Formula

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

Example with Units

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

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

Evaluate Formula ➦

Formula

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

Example with Units

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

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6) Population Density given Sanitary Sewer System Flow Rate Formula 🗗

Formula

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

Example with Units

$$23.7624 \,_{\text{Hundred/km}^2} = \frac{1.2 \,_{\text{L/s}}}{50 \,_{\text{m}^2} \cdot 1.01 \,_{\text{m}^3/\text{s}}}$$

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

Formula

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

Example with Units

$$1.0101 \,_{\text{m}^3/\text{s}} = \frac{1.2 \,_{\text{L/s}}}{50 \,_{\text{m}^2} \cdot 23.76 \,_{\text{Hundred/km}^2}}$$

8) Sanitary Sewer System Flow Rate Formula 🗗

Formula

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

Example with Units

$$1.1999 \,_{\text{L/s}} = 50 \,_{\text{m}^2} \cdot 23.76 \,_{\text{Hundred/km}^2} \cdot 1.01 \,_{\text{m}^3/\text{s}}$$

9) Sewer System Length given Total Infiltration to Sanitary Sewer Formula 🗗

Formula

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

Example with Units

$$0.3333 \,_{\text{m}} = \frac{30 \,_{\text{m}^2/\text{s}}}{90 \,_{\text{m}^3/\text{s}}}$$

10) Total Infiltration to Sanitary Sewer Formula 🗗

Formula

$$F = I \cdot L$$

Example with Units

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

Variables used in list of Sanitary System Sewer Design Formulas above

- **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 in list of Sanitary System Sewer Design Formulas above

- Functions: **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 ➦

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7/8/2024 | 8:37:01 AM UTC