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Minimum Velocity to be Generated in Sewers Formulas

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List of 29 Minimum Velocity to be Generated in Sewers Formulas

Minimum Velocity to be Generated in Sewers

1) Chezy's Constant given Friction Factor

Open Calculator

fx $$C = \sqrt{\frac{8 \cdot [g]}{f'}}$$

ex $$15.01467 = \sqrt{\frac{8 \cdot [g]}{0.348}}$$

2) Chezy's Constant given Self Cleansing Velocity

Open Calculator

fx $$C = \frac{v_s}{\sqrt{k \cdot d' \cdot (G - 1)}}$$

ex $$15.02082 = \frac{0.114\text{m/s}}{\sqrt{0.04 \cdot 4.8\text{mm} \cdot (1.3 - 1)}}$$

3) Cross Sectional Area of Flow given Hydraulic Mean Radius of Channel

Open Calculator

fx $$A_w = (m \cdot P)$$

ex $$120\text{m}^2 = (10\text{m} \cdot 12\text{m})$$

4) Friction Factor given Self Cleansing Velocity

Open Calculator

$$f' = \frac{8 \cdot [g] \cdot k \cdot d' \cdot (G - 1)}{(v_s)^2}$$

$$0.347715 = \frac{8 \cdot [g] \cdot 0.04 \cdot 4.8\text{mm} \cdot (1.3 - 1)}{(0.114\text{m/s})^2}$$

5) Rugosity Coefficient given Self Cleansing Velocity

Open Calculator

$$n = \left(\frac{1}{v_s}\right) \cdot (m)^{\frac{1}{6}} \cdot \sqrt{k \cdot d' \cdot (G - 1)}$$

$$0.097718 = \left(\frac{1}{0.114\text{m/s}}\right) \cdot (10\text{m})^{\frac{1}{6}} \cdot \sqrt{0.04 \cdot 4.8\text{mm} \cdot (1.3 - 1)}$$

6) Unit Weight of Water given Hydraulic Mean Depth

Open Calculator

$$\gamma_w = \frac{F_D}{m \cdot S}$$

$$9983.333\text{N/m}^3 = \frac{11.98\text{N}}{10\text{m} \cdot 0.00012}$$

Diameter of Grain

7) Diameter of Grain for given Friction Factor

Open Calculator

$$d' = \frac{(v_s)^2}{\frac{8 \cdot [g] \cdot k \cdot (G-1)}{f'}}$$

$$4.803934\text{mm} = \frac{(0.114\text{m/s})^2}{\frac{8 \cdot [g] \cdot 0.04 \cdot (1.3-1)}{0.348}}$$

8) Diameter of Grain given Rugosity Coefficient

Open Calculator

$$d' = \left(\frac{1}{k \cdot (G-1)}\right) \cdot \left(\frac{v_s \cdot n}{(m)^{\frac{1}{6}}}\right)^2$$

$$0.113104\text{mm} = \left(\frac{1}{0.04 \cdot (1.3-1)}\right) \cdot \left(\frac{0.114\text{m/s} \cdot 0.015}{(10\text{m})^{\frac{1}{6}}}\right)^2$$

9) Diameter of Grain given Self Cleaning Invert Slope

Open Calculator

$$d' = \frac{sL_I}{\left(\frac{k}{m}\right) \cdot (G-1)}$$

$$4.8\text{mm} = \frac{5.76\text{E}\hat{}\text{-6}}{\left(\frac{0.04}{10\text{m}}\right) \cdot (1.3-1)}$$

10) Diameter of Grain given Self Cleansing velocity

Open Calculator

fx $$d' = \frac{\left(\frac{v_s}{C}\right)^2}{k \cdot (G - 1)}$$

ex $$4.813333\text{mm} = \frac{\left(\frac{0.114\text{m/s}}{15}\right)^2}{0.04 \cdot (1.3 - 1)}$$

Drag Force

11) Angle of Inclination given drag force

Open Calculator

fx $$\alpha_i = ar\sin\left(\frac{F_D}{\gamma_w \cdot (G - 1) \cdot (1 - n) \cdot t}\right)$$

ex $$59.83416^\circ = ar\sin\left(\frac{11.98\text{N}}{9810\text{N/m}^3 \cdot (1.3 - 1) \cdot (1 - 0.015) \cdot 4.78\text{mm}}\right)$$

12) Bed Slope of Channel given Drag Force

Open Calculator

fx $$S = \frac{F_D}{\gamma_w \cdot m}$$

ex $$0.000122 = \frac{11.98\text{N}}{9810\text{N/m}^3 \cdot 10\text{m}}$$

13) Drag Force Exerted by Flowing Water

Open Calculator

$$F_D = \gamma_w \cdot (G - 1) \cdot (1 - n) \cdot t \cdot \sin(\alpha_i)$$

$$12.0001\text{N} = 9810\text{N/m}^3 \cdot (1.3 - 1) \cdot (1 - 0.015) \cdot 4.78\text{mm} \cdot \sin(60^\circ)$$

14) Drag Force or Intensity of Tractive force

Open Calculator

$$F_D = \gamma_w \cdot m \cdot S$$

$$11.772\text{N} = 9810\text{N/m}^3 \cdot 10\text{m} \cdot 0.00012$$

15) Rugosity Coefficient given Drag Force

Open Calculator

$$n = 1 - \left(\frac{F_D}{\gamma_w \cdot (G - 1) \cdot t \cdot \sin(\alpha_i)} \right)$$

$$0.01665 = 1 - \left(\frac{11.98\text{N}}{9810\text{N/m}^3 \cdot (1.3 - 1) \cdot 4.78\text{mm} \cdot \sin(60^\circ)} \right)$$

16) Thickness of Sediment given Drag Force

Open Calculator

$$t = \left(\frac{F_D}{\gamma_w \cdot (G - 1) \cdot (1 - n) \cdot \sin(\alpha_i)} \right)$$

$$4.771992\text{mm} = \left(\frac{11.98\text{N}}{9810\text{N/m}^3 \cdot (1.3 - 1) \cdot (1 - 0.015) \cdot \sin(60^\circ)} \right)$$

17) Unit Weight of Water given Drag Force

Open Calculator

$$\gamma_w = \left(\frac{F_D}{(G-1) \cdot (1-n) \cdot t \cdot \sin(\alpha_i)} \right)$$

$$9793.565\text{N/m}^3 = \left(\frac{11.98\text{N}}{(1.3-1) \cdot (1-0.015) \cdot 4.78\text{mm} \cdot \sin(60^\circ)} \right)$$

Hydraulic Mean Depth

18) Hydraulic Mean Depth given Self Cleaning Invert Slope

Open Calculator

$$m = \left(\frac{k}{sL_I} \right) \cdot (G-1) \cdot d'$$

$$10\text{m} = \left(\frac{0.04}{5.76\text{E}\hat{}\text{-6}} \right) \cdot (1.3-1) \cdot 4.8\text{mm}$$

19) Hydraulic Mean Depth given Self Cleansing Velocity

Open Calculator

$$m = \left(\frac{v_s \cdot n}{\sqrt{k \cdot d' \cdot (G-1)}} \right)^6$$

$$0.000131\text{m} = \left(\frac{0.114\text{m/s} \cdot 0.015}{\sqrt{0.04 \cdot 4.8\text{mm} \cdot (1.3-1)}} \right)^6$$

20) Hydraulic Mean Depth of Channel given Drag Force

Open Calculator

$$\mathrm{fx}\quad m = \frac{F_D}{\gamma_w \cdot S}$$

$$\mathrm{ex}\quad 10.17669\text{m} = \frac{11.98\text{N}}{9810\text{N/m}^3 \cdot 0.00012}$$

Self Cleansing Velocity

21) Self Cleaning Invert Slope

Open Calculator

$$\mathrm{fx}\quad sL_I = \left(\frac{k}{m}\right) \cdot (G - 1) \cdot d'$$

$$\mathrm{ex}\quad 5.8\text{E}\hat{}\text{-}6 = \left(\frac{0.04}{10\text{m}}\right) \cdot (1.3 - 1) \cdot 4.8\text{mm}$$

22) Self Cleansing Velocity

Open Calculator

$$\mathrm{fx}\quad v_s = C \cdot \sqrt{k \cdot d' \cdot (G - 1)}$$

$$\mathrm{ex}\quad 0.113842\text{m/s} = 15 \cdot \sqrt{0.04 \cdot 4.8\text{mm} \cdot (1.3 - 1)}$$

23) Self Cleansing Velocity given Friction Factor

Open Calculator

$$v_s = \sqrt{\frac{8 \cdot [g] \cdot k \cdot d' \cdot (G - 1)}{f'}}$$

$$0.113953\text{m/s} = \sqrt{\frac{8 \cdot [g] \cdot 0.04 \cdot 4.8\text{mm} \cdot (1.3 - 1)}{0.348}}$$

24) Self Cleansing Velocity given Rugosity Coefficient

Open Calculator

$$v_s = \left(\frac{1}{n}\right) \cdot (m)^{\frac{1}{6}} \cdot \sqrt{k \cdot d' \cdot (G - 1)}$$

$$0.742654\text{m/s} = \left(\frac{1}{0.015}\right) \cdot (10\text{m})^{\frac{1}{6}} \cdot \sqrt{0.04 \cdot 4.8\text{mm} \cdot (1.3 - 1)}$$

Specific Gravity of Sediment

25) Specific Gravity of Sediment given Drag Force

Open Calculator

$$G = \left(\frac{F_D}{\gamma_w \cdot (1 - n) \cdot t \cdot \sin(\alpha_i)}\right) + 1$$

$$1.299497 = \left(\frac{11.98\text{N}}{9810\text{N/m}^3 \cdot (1 - 0.015) \cdot 4.78\text{mm} \cdot \sin(60^\circ)}\right) + 1$$

26) Specific Gravity of Sediment given Friction Factor

Open Calculator

fx $$G = \left(\frac{(v_s)^2}{\frac{8 \cdot [g] \cdot k \cdot d'}{f'}} \right) + 1$$

ex $$1.300246 = \left(\frac{(0.114\text{m/s})^2}{\frac{8 \cdot [g] \cdot 0.04 \cdot 4.8\text{mm}}{0.348}} \right) + 1$$

27) Specific Gravity of Sediment given Self Cleaning Invert Slope

Open Calculator

fx $$G = \left(\frac{sL_I}{\left(\frac{k}{m}\right) \cdot d'} \right) + 1$$

ex $$1.3 = \left(\frac{5.76E\hat{}\text{-}6}{\left(\frac{0.04}{10\text{m}}\right) \cdot 4.8\text{mm}} \right) + 1$$

28) Specific Gravity of Sediment given Self Cleansing Velocity

Open Calculator

fx $$G = \left(\frac{\left(\frac{v_s}{C}\right)^2}{d' \cdot k} \right) + 1$$

ex $$1.300833 = \left(\frac{\left(\frac{0.114\text{m/s}}{15}\right)^2}{4.8\text{mm} \cdot 0.04} \right) + 1$$

29) Specific Gravity of Sediment given Self Cleansing Velocity and Rugosity Coefficient

Open Calculator

fx $$G = \left(\frac{1}{k \cdot d'}\right) \cdot \left(\frac{v_s \cdot n}{(m)^{\frac{1}{6}}}\right)^2 + 1$$

ex $$1.007069 = \left(\frac{1}{0.04 \cdot 4.8\text{mm}}\right) \cdot \left(\frac{0.114\text{m/s} \cdot 0.015}{(10\text{m})^{\frac{1}{6}}}\right)^2 + 1$$

Variables Used

- A_w Wetted Area *(Square Meter)*
- C Chezy's Constant
- d' Diameter of Particle *(Millimeter)*
- f' Friction Factor
- F_D Drag Force *(Newton)*
- G Specific Gravity of Sediment
- k Dimensional Constant
- m Hydraulic Mean Depth *(Meter)*
- n Rugosity Coefficient
- P Wetted Perimeter *(Meter)*
- $\bar{S}$ Bed Slope of a Sewer
- sL_l Self Cleaning Invert Slope
- t Volume per Unit Area *(Millimeter)*
- v_s Self Cleansing Velocity *(Meter per Second)*
- α_i Angle of Inclination of Plane to Horizontal *(Degree)*
- γ_w Unit Weight of Fluid *(Newton per Cubic Meter)*

Constants, Functions, Measurements used

- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- Function: **arsin**, arsin(Number)
  Arcsine function, is a trigonometric function that takes a ratio of two sides of a right triangle and outputs the angle opposite the side with the given ratio.
- Function: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- 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 Millimeter (mm), Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Specific Weight** in Newton per Cubic Meter (N/m³)
  Specific Weight Unit Conversion

Check other formula lists

- **Flow Velocity in Sewers and Drains Formulas**
- **Hydraulic Mean Depth Formulas**
- **Minimum Velocity to be Generated in Sewers Formulas**
- **Proportionate Hydraulic Elements for Circular Sewers Formulas**
- **Roughness Coefficient Formulas**

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