Important Flow Velocity in Straight Sewers Formulas PDF





9) Controlling Sewer Water Flow Formulas 🕝

9.1) Area for Siphon Throat Formula 🕝



9.2) Coefficient of Discharge given Area for Siphon Throat Formula 🕝







9.4) Discharge given Area for Siphon Throat Formula (*)
Formula

$$\begin{bmatrix} Formula \\ (2 + A_{s} + C_{d} + (2 + g + H)^{\frac{1}{2}} \\ 1.9341 m^{3}/s = 0.12 m^{2} + 0.94 + (2 + 9.8 m/s^{2} + 15 m)^{\frac{1}{2}} \\ \hline 9.5) Flow Diversion for Side Weir Formula (*)
9.5) Flow Diversion for Side Weir Formula (*)
$$\begin{bmatrix} Formula \\ (2 + 3.32 + L_{weir}^{0.083} + h^{1.67} \\ (2 + 3.32 + L_{weir}^{0.083} + h^{1.67} \\ (1.4968 m^{2}/s = 3.32 + 0.60 m^{0.83} + 0.80 m^{1.67} \\ \hline 9.6) Head given Area for Siphon Throat Formula (*)
9.6) Head given Area for Siphon Throat Formula (*)
$$\begin{bmatrix} Formula \\ (2 + 3.32 + L_{weir}^{0.167} + L_{2}^{0.167} \\ (1 + 2 + g) \\ (2 + g) \\ ($$$$$$

Formula Example with Units

$$_{0} = \frac{Q_{i}}{0.6 \cdot (2 \cdot g \cdot D)^{\frac{1}{2}}} \qquad 9.1287 \, \text{m}^{2} = \frac{42 \, \text{m}^{3}/\text{s}}{0.6 \cdot (2 \cdot 9.8 \, \text{m/s}^{2} \cdot 3 \, \text{m})^{\frac{1}{2}}}$$

10.2) Depression in Curb Inlet given Runoff Quantity with Full Gutter flow Formula 🕝

Formula
$$a = \left(\left(\frac{Q_{ro}}{0.7 \cdot L_0} \right)^{\frac{2}{3}} \right) - y$$

Example with Units

$$4.0004 \,\text{ft} = \left(\left(\frac{329 \,\text{ft}^3/\text{s}}{0.7 \cdot 7 \,\text{ft}} \right)^{\frac{2}{3}} \right) - 7.117 \,\text{ft}$$

10.3) Depth of Flow at Inlet given Inlet Capacity for Flow Depth up to 4.8in Formula 🕝

FormulaExample with UnitsEvaluate Formula
$$y = \left(\frac{Q_w}{3 \cdot P}\right)^{\frac{2}{3}}$$
7.1178 ft = $\left(\frac{14.61 \text{ m}^3/\text{s}}{3 \cdot 5 \text{ ft}}\right)^{\frac{2}{3}}$



A

Evaluate Formula 🕝

10.4) Depth of Flow at Inlet given Runoff Quantity with Full Gutter Flow Formula

Evaluate Formula

Evaluate Formula

Evaluate Formula

Formula Example with Units
$$r = \left(\left(\frac{Q_{ro}}{0.7 \cdot L_o} \right)^{\frac{2}{3}} \right) - a \qquad \boxed{7.1174_{ft} = \left(\left(\frac{329_{ft}^3/s}{0.7 \cdot 7_{ft}} \right)^{\frac{2}{3}} \right) - 4_{ft}}$$

J

10.5) Depth of Flow given Inlet Capacity for Flow Depth more than 1ft 5in Formula

FormulaExample with UnitsEvaluate Formula
$$D = \left(\left(\frac{Q_i}{0.6 \cdot A_0} \right)^2 \right) \cdot \left(\frac{1}{2 \cdot g} \right)$$
 $3.0005 \, \mathrm{m} = \left(\left(\frac{42 \, \mathrm{m}^3/\mathrm{s}}{0.6 \cdot 9.128 \, \mathrm{m}^2} \right)^2 \right) \cdot \left(\frac{1}{2 \cdot 9.8 \, \mathrm{m/s}^2} \right)$

10.6) Inlet Capacity for Flow Depth FormulaEvaluate FormulaEvaluate FormulaFormulaExample with Units
$$Q_w = 3 \cdot P \cdot y^2$$
 $14.6074 \text{ m}^3/\text{s} = 3 \cdot 5 \text{ ft} \cdot 7.117 \text{ ft}^{\frac{3}{2}}$ 10.7) Inlet Capacity for Flow Depth more than 1ft 5in FormulaEvaluate FormulaEvaluate FormulaEvaluate FormulaEvaluate Formula(10.7) Inlet Capacity for Flow Depth more than 1ft 5in FormulaEvaluate FormulaFormulaEvaluate FormulaQ_1 = 0.6 \cdot A_0 \cdot ((2 \cdot g \cdot D)^{\frac{1}{2}}) $41.9967 \text{ m}^3/\text{s} = 0.6 \cdot 9.128 \text{ m}^2 \cdot ((2 \cdot 9.8 \text{ m/s}^2 \cdot 3 \text{ m})^{\frac{1}{2}})$

10.8) Length of Opening given Runoff Quantity with Full Gutter Flow Formula

Formula
 Example with Units

$$L_0 = \frac{Q_{ro}}{0.7 \cdot (a + y)^{\frac{3}{2}}}$$
 $7.0004 \text{ ft} = \frac{329 \text{ ft}^3/\text{s}}{0.7 \cdot (4 \text{ ft} + 7.117 \text{ ft})^{\frac{3}{2}}}$

10.9) Perimeter when Inlet Capacity for Flow Depth is up to 4.8 inches Formula

Formula	Example with Units	
$P = \frac{Q_w}{3 \cdot y^{\frac{3}{2}}}$	$5.0009tt = \frac{14.61m^3/s}{3\cdot7.117tt^{\frac{3}{2}}}$	





11) Required Flow Velocity Formulas 🕝

11.1) Coefficient of Roughness given Flow Quantity of Full Flowing Sewer Formula 🕝

Evaluate Formula 🦳

Evaluate Formula



11.2) Coefficient of Roughness given Full Flow Velocity in Sewer Formula



11.3) Energy Loss given Flow Quantity for Full Flowing Sewer Formula 🕝







11.6) Full flow velocity in sewer Formula 🕝

Formula	Example with Units
$V_{f} = \frac{0.59 \cdot d_{i}^{\frac{2}{3}} \cdot S^{\frac{1}{2}}}{n_{c}}$	$525.1662 \mathrm{m/s} = \frac{0.59 \cdot 35 \mathrm{m}^{\frac{2}{3}} \cdot 2 \mathrm{J}^{\frac{1}{2}}}{0.017}$



11.7) Inside Diameter given Flow Quantity for Full Flowing Sewer Formula 🕝

Evaluate Formula 🕝

Evaluate Formula 🕝

Formula	Example with Units	
$d_{i} = \left(\frac{Q_{w} \cdot n_{c}}{0.463 \cdot S^{\frac{1}{2}}}\right)^{\frac{3}{8}}$	$0.6952 \mathrm{m} = \left(\frac{14.61 \mathrm{m}^3/\mathrm{s} \cdot 0.017}{0.463 \cdot 2\mathrm{J}^{\frac{1}{2}}}\right)^{\frac{3}{8}}$	

11.8) Inside Diameter given Full Flow Velocity in Sewer Formula 🕝

Formula
 Example with Units

$$d_i = \left(\frac{V_f \cdot n_c}{0.59 \cdot S^{\frac{1}{2}}}\right)^{\frac{3}{2}}$$
 $0.0034_m = \left(\frac{1.12 \text{ m/s} \cdot 0.017}{0.59 \cdot 2J^{\frac{1}{2}}}\right)^{\frac{3}{2}}$



Variables used in list of Flow Velocity in Straight Sewers Formulas above

- a Depression in Curb Inlet (Foot)
- Acs Cross-Sectional Area (Square Meter)
- Ao Area of Opening (Square Meter)
- A_s Area for Siphon Throat (Square Meter)
- Asiphon Siphon Throat Area (Square Meter)
- Conversion Factor
- C_d Coefficient of Discharge
- Cd' Discharge Coefficient
- D Depth (Meter)
- d_i Inner Diameter (Meter)
- Dis Inner Diameter of Sewer (Millimeter)
- **g** Acceleration due to Gravity (Meter per Square Second)
- h Depth of Flow Over Weir (Meter)
- H Head of Liquid (Meter)
- Lo Length of Opening (Foot)
- Lweir Length of Weir (Meter)
- n Manning's Roughness Coefficient
- n_c Roughness Coefficient of Conduit Surface
- P Perimeter of Grate Opening (Foot)
- Q Volume Flow Rate (Cubic Meter per Second)
- Q_i Inlet Capacity (Cubic Meter per Second)
- **Q**ro Runoff Quantity (Cubic Foot per Second)
- **Q**_w Water Flow (Cubic Meter per Second)
- **r_H** Hydraulic Radius (Meter)
- S Energy Loss (Joule)
- V_f Flow Velocity (Meter per Second)
- y Depth of Flow at Inlet (Foot)

Constants, Functions, Measurements used in list of Flow Velocity in Straight Sewers Formulas above

- Measurement: Length in Meter (m), Foot (ft), Millimeter (mm)
 Length Unit Conversion C
- Measurement: Area in Square Meter (m²) Area Unit Conversion
- Measurement: Speed in Meter per Second (m/s) Speed Unit Conversion
- Measurement: Acceleration in Meter per Square Second (m/s²) Acceleration Unit Conversion
- Measurement: Energy in Joule (J) Energy Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/s), Cubic Foot per Second (ft³/s)

Volumetric Flow Rate Unit Conversion 🕝



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- LCM of two numbers

Proper fraction C

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