Important Hazen Williams Formula Formulas PDF

Formulas
Examples
with Units

List of 18
Important Hazen Williams Formula Formulas

1) Coefficient Dependent on Pipe given Head Loss Formula

Evaluate Formula

Formula

$$C = \left(\frac{6.78 \cdot L_p \cdot v_{avg}^{1.85}}{\left(D_p^{1.165} \right) \cdot H_{L'}} \right)^{\frac{1}{1.85}}$$

Example with Units

$$31.3284 = \left(\frac{6.78 \cdot 2.5\,\text{m} \cdot 4.57\,\text{m/s}^{1.85}}{\left(0.4\,\text{m}^{1.165} \right) \cdot 1.4\,\text{m}} \right)^{\frac{1}{1.85}}$$

2) Coefficient Dependent on Pipe given Radius of Pipe Formula

Evaluate Formula

Formula

$$C = \left(\frac{6.78 \cdot L_p \cdot v_{avg}^{1.85}}{\left(\left(2 \cdot R \right)^{1.165} \right) \cdot H_{L'}} \right)^{\frac{1}{1.85}}$$

Example with Units

$$31.3284 = \left(\frac{6.78 \cdot 2.5\,\text{m} \cdot 4.57\,\text{m/s}^{1.85}}{\left(\left(2 \cdot 200\,\text{mm} \right)^{1.165} \right) \cdot 1.4\,\text{m}} \right)^{\frac{1}{1.85}}$$

3) Coefficient of Roughness of Pipe given Diameter of Pipe Formula

Evaluate Formula

Formula

$$C = \frac{v_{avg}}{0.355 \cdot \left(\left(D_{pipe} \right)^{0.63} \right) \cdot \left(S \right)^{0.54}}$$

Example with Units

$$31.3223 = \frac{4.57\,\text{m/s}}{0.355 \cdot \left(\left(0.8\,\text{m} \right)^{0.63} \right) \cdot \left(0.25 \right)^{0.54}}$$

4) Coefficient of Roughness of Pipe given Mean Velocity of Flow Formula

Evaluate Formula

Formula

$$C = \frac{v_{avg}}{0.85 \cdot \left(\left(R \right)^{0.63} \right) \cdot \left(S \right)^{0.54}}$$

Example with Units

$$31.33 = \frac{4.57\,\text{m/s}}{0.85 \cdot \left(\left(200\,\text{mm} \right)^{0.63} \right) \cdot \left(0.25 \right)^{0.54}}$$

5) Diameter of Pipe given Head Loss by Hazen Williams Formula Formula

Evaluate Formula

Formula

$$D_p = \left(\frac{6.78 \cdot L_p \cdot v_{avg}^{1.85}}{h_f \cdot C^{1.85}} \right)^{\frac{1}{1.165}}$$

Example with Units

$$0.4566\,\text{m} = \left(\frac{6.78 \cdot 2.5\,\text{m} \cdot 4.57\,\text{m/s}^{1.85}}{1.2\,\text{m} \cdot 31.33^{1.85}} \right)^{\frac{1}{1.165}}$$

6) Diameter of Pipe given Hydraulic Gradient Formula

Evaluate Formula

Formula

$$D_{pipe} = \left(\frac{v_{avg}}{0.355 \cdot C \cdot \left(S \right)^{0.54}} \right)^{\frac{1}{0.63}}$$

Example with Units

$$0.7997\,\text{m} = \left(\frac{4.57\,\text{m/s}}{0.355 \cdot 31.33 \cdot \left(0.25 \right)^{0.54}} \right)^{\frac{1}{0.63}}$$

7) Head Loss by Hazen Williams Formula Formula

Evaluate Formula

Formula

$$H_{L'} = \frac{6.78 \cdot L_p \cdot v_{avg}^{1.85}}{\left(D_p^{1.165} \right) \cdot C^{1.85}}$$

Example with Units

$$1.3999\,\text{m} = \frac{6.78 \cdot 2.5\,\text{m} \cdot 4.57\,\text{m/s}^{1.85}}{\left(0.4\,\text{m}^{1.165} \right) \cdot 31.33^{1.85}}$$

8) Head Loss by Hazen Williams Formula given Radius of Pipe Formula

Evaluate Formula

Formula

$$H_{L'} = \frac{6.78 \cdot L_p \cdot v_{avg}^{1.85}}{\left(\left(2 \cdot R \right)^{1.165} \right) \cdot C^{1.85}}$$

Example with Units

$$1.3999\,\text{m} = \frac{6.78 \cdot 2.5\,\text{m} \cdot 4.57\,\text{m/s}^{1.85}}{\left(\left(2 \cdot 200\,\text{mm} \right)^{1.165} \right) \cdot 31.33^{1.85}}$$

9) Hydraulic Gradient given Diameter of Pipe Formula

Evaluate Formula

Formula

$$S = \left(\frac{v_{avg}}{0.355 \cdot C \cdot \left(\left(D_p \right)^{0.63} \right)} \right)^{\frac{1}{0.54}}$$

Example with Units

$$0.561 = \left(\frac{4.57\,\text{m/s}}{0.355 \cdot 31.33 \cdot \left(\left(0.4\,\text{m} \right)^{0.63} \right)} \right)^{\frac{1}{0.54}}$$

10) Hydraulic Gradient given Mean Velocity of Flow Formula

Evaluate Formula

Formula

$$S = \left(\frac{v_{avg}}{0.85 \cdot C \cdot \left(\left(R \right)^{0.63} \right)} \right)^{\frac{1}{0.54}}$$

Example with Units

$$0.25 = \left(\frac{4.57\,\text{m/s}}{0.85 \cdot 31.33 \cdot \left(\left(200\,\text{mm} \right)^{0.63} \right)} \right)^{\frac{1}{0.54}}$$

11) Hydraulic Radius given Mean Velocity of Flow Formula

Evaluate Formula

Formula

$$R = \left(\frac{v_{avg}}{0.85 \cdot C \cdot \left(S \right)^{0.54}} \right)^{\frac{1}{0.63}}$$

Example with Units

$$200.0003\,\text{mm} = \left(\frac{4.57\,\text{m/s}}{0.85 \cdot 31.33 \cdot \left(0.25 \right)^{0.54}} \right)^{\frac{1}{0.63}}$$

12) Length of Pipe by Hazen Williams Formula given Radius of Pipe Formula

Evaluate Formula

Formula

$$L_p = \frac{h_f}{\frac{6.78 \cdot v_{avg}^{1.85}}{\left(\left(2 \cdot R \right)^{1.165} \right) \cdot C^{1.85}}}$$

Example with Units

$$2.1431\,\text{m} = \frac{1.2\,\text{m}}{\frac{6.78 \cdot 4.57\,\text{m/s}^{1.85}}{\left(\left(2 \cdot 200\,\text{mm} \right)^{1.165} \right) \cdot 31.33^{1.85}}}$$

13) Length of Pipe given Head Loss by Hazen Williams Formula Formula

Evaluate Formula

Formula

$$L_p = \frac{h_f}{\frac{6.78 \cdot v_{avg}^{1.85}}{\left(D_p^{1.165} \right) \cdot C^{1.85}}}$$

Example with Units

$$2.1431\,\text{m} = \frac{1.2\,\text{m}}{\frac{6.78 \cdot 4.57\,\text{m/s}^{1.85}}{\left(0.4\,\text{m}^{1.165} \right) \cdot 31.33^{1.85}}}$$

14) Mean Velocity of Flow in Pipe by Hazen Williams Formula Formula

Evaluate Formula

Formula

$$v_{avg} = 0.85 \cdot C \cdot \left(\left(R \right)^{0.63} \right) \cdot \left(S \right)^{0.54}$$

Example with Units

$$4.57\,\text{m/s} = 0.85 \cdot 31.33 \cdot \left(\left(200\,\text{mm} \right)^{0.63} \right) \cdot \left(0.25 \right)^{0.54}$$

15) Mean Velocity of Flow in Pipe given Diameter of Pipe Formula

Evaluate Formula

Formula

$$v_{avg} = 0.355 \cdot C \cdot \left(\left(D_p \right)^{0.63} \right) \cdot \left(S \right)^{0.54}$$

Example with Units

$$2.9538\,\text{m/s} = 0.355 \cdot 31.33 \cdot \left(\left(0.4\,\text{m} \right)^{0.63} \right) \cdot \left(0.25 \right)^{0.54}$$

16) Radius of Pipe by Hazen Williams Formula given Length of Pipe Formula

Evaluate Formula

Formula

$$R = \left(\frac{6.78 \cdot L_p \cdot v_{avg}^{1.85}}{\left((2)^{1.165} \right) \cdot h_f \cdot C^{1.85}} \right)^{\frac{1}{1.165}}$$

Example with Units

$$228.2763\,\text{mm} = \left(\frac{6.78 \cdot 2.5\,\text{m} \cdot 4.57\,\text{m/s}^{1.85}}{\left((2)^{1.165} \right) \cdot 1.2\,\text{m} \cdot 31.33^{1.85}} \right)^{\frac{1}{1.165}}$$

17) Velocity of Flow by Hazen Williams Formula given Radius of Pipe Formula

Evaluate Formula

Formula

$$v_{avg} = \left(\frac{h_f}{\frac{6.78 \cdot L_p}{\left((2 \cdot R)^{1.165} \right) \cdot C^{1.85}}} \right)^{\frac{1}{1.85}}$$

Example with Units

$$4.2048\,\text{m/s} = \left(\frac{1.2\,\text{m}}{\frac{6.78 \cdot 2.5\,\text{m}}{\left((2 \cdot 200\,\text{mm})^{1.165} \right) \cdot 31.33^{1.85}}} \right)^{\frac{1}{1.85}}$$

18) Velocity of Flow given Head Loss by Hazen Williams Formula Formula

Evaluate Formula

Formula

$$v_{avg} = \left(\frac{h_f}{\frac{6.78 \cdot L_p}{\left(D_p^{1.165} \right) \cdot C^{1.85}}} \right)^{\frac{1}{1.85}}$$

Example with Units

$$4.2048\,\text{m/s} = \left(\frac{1.2\,\text{m}}{\frac{6.78 \cdot 2.5\,\text{m}}{\left(0.4\,\text{m}^{1.165} \right) \cdot 31.33^{1.85}}} \right)^{\frac{1}{1.85}}$$

Variables used in list of Hazen Williams Formula above

- **C** Coefficient of Roughness of Pipe
- D_p Diameter of Pipe *(Meter)*
- D_{pipe} Pipe Diameter *(Meter)*
- h_f Head Loss *(Meter)*
- $H_{L'}$ Head Loss in Pipe *(Meter)*
- L_p Length of Pipe *(Meter)*
- **R** Pipe Radius *(Millimeter)*
- **S** Hydraulic Gradient
- v_{avg} Average Velocity in Pipe Fluid Flow *(Meter per Second)*

Constants, Functions, Measurements used in list of Hazen Williams Formula above

- Measurement: **Length** in Meter (m), Millimeter (mm)
  Length Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion

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