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Hazen Williams Formula Formulas

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List of 18 Hazen Williams Formula Formulas

Hazen Williams Formula

1) Coefficient Dependent on Pipe given Head Loss

Open Calculator

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

ex $$31.32844 = \left(\frac{6.78 \cdot 2.5\text{m} \cdot (4.57\text{m/s})^{1.85}}{\left((0.4\text{m})^{1.165}\right) \cdot 1.4\text{m}} \right)^{\frac{1}{1.85}}$$

2) Coefficient Dependent on Pipe given Radius of Pipe

Open Calculator

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

ex $$31.32844 = \left(\frac{6.78 \cdot 2.5\text{m} \cdot (4.57\text{m/s})^{1.85}}{\left((2 \cdot 200\text{mm})^{1.165}\right) \cdot 1.4\text{m}} \right)^{\frac{1}{1.85}}$$

3) Coefficient of Roughness of Pipe given Diameter of Pipe

Open Calculator

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

$$31.32229 = \frac{4.57\text{m/s}}{0.355 \cdot \left((0.8\text{m})^{0.63} \right) \cdot (0.25)^{0.54}}$$

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

Open Calculator

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

$$31.33003 = \frac{4.57\text{m/s}}{0.85 \cdot \left((200\text{mm})^{0.63} \right) \cdot (0.25)^{0.54}}$$

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

Open Calculator

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

$$0.456553\text{m} = \left(\frac{6.78 \cdot 2.5\text{m} \cdot (4.57\text{m/s})^{1.85}}{1.2\text{m} \cdot (31.33)^{1.85}} \right)^{\frac{1}{1.165}}$$

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6) Diameter of Pipe given Hydraulic Gradient

Open Calculator

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

$$0.799688\text{m} = \left(\frac{4.57\text{m/s}}{0.355 \cdot 31.33 \cdot (0.25)^{0.54}} \right)^{\frac{1}{0.63}}$$

7) Head Loss by Hazen Williams Formula

Open Calculator

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

$$1.399871\text{m} = \frac{6.78 \cdot 2.5\text{m} \cdot (4.57\text{m/s})^{1.85}}{\left((0.4\text{m})^{1.165}\right) \cdot (31.33)^{1.85}}$$

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

Open Calculator

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

$$1.399871\text{m} = \frac{6.78 \cdot 2.5\text{m} \cdot (4.57\text{m/s})^{1.85}}{\left((2 \cdot 200\text{mm})^{1.165}\right) \cdot (31.33)^{1.85}}$$

9) Hydraulic Gradient given Diameter of Pipe

Open Calculator

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

ex
$$0.560975 = \left(\frac{4.57\text{m/s}}{0.355 \cdot 31.33 \cdot \left((0.4\text{m})^{0.63} \right)} \right)^{\frac{1}{0.54}}$$

10) Hydraulic Gradient given Mean Velocity of Flow

Open Calculator

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

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

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11) Hydraulic Radius given Mean Velocity of Flow

Open Calculator

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

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

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

Open Calculator

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

ex $$2.143054\text{m} = \frac{1.2\text{m}}{\frac{6.78 \cdot (4.57\text{m/s})^{1.85}}{\left((2 \cdot 200\text{mm})^{1.165}\right) \cdot (31.33)^{1.85}}}$$

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

Open Calculator

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

ex $$2.143054\text{m} = \frac{1.2\text{m}}{\frac{6.78 \cdot (4.57\text{m/s})^{1.85}}{\left((0.4\text{m})^{1.165}\right) \cdot (31.33)^{1.85}}}$$

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

Open Calculator

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

ex $$4.569996\text{m/s} = 0.85 \cdot 31.33 \cdot \left((200\text{mm})^{0.63} \right) \cdot (0.25)^{0.54}$$

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

Open Calculator

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

ex $$2.953753\text{m/s} = 0.355 \cdot 31.33 \cdot \left((0.4\text{m})^{0.63} \right) \cdot (0.25)^{0.54}$$

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

Open Calculator

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

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

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

Open Calculator

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

ex
$$4.204849\text{m/s} = \left(\frac{1.2\text{m}}{\frac{6.78 \cdot 2.5\text{m}}{\left((2 \cdot 200\text{mm})^{1.165}\right) \cdot (31.33)^{1.85}}} \right)^{\frac{1}{1.85}}$$

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

Open Calculator

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

ex
$$4.204849\text{m/s} = \left(\frac{1.2\text{m}}{\frac{6.78 \cdot 2.5\text{m}}{\left((0.4\text{m})^{1.165}\right) \cdot (31.33)^{1.85}}} \right)^{\frac{1}{1.85}}$$

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Variables Used

- **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)*

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Constants, Functions, Measurements used

- 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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