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Metering Flumes and Momentum in Open Channel Flow Specific Force Formulas

Calculators! Examples! Conversions!

List of 15 Metering Flumes and Momentum in Open Channel Flow Specific Force Formulas

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Metering Flumes

1) Coefficient of Discharge through Flume given Discharge Flow through Channel

Open Calculator

fx
$$C_d = \left(\frac{Q}{A_i \cdot A_f} \cdot \left(\sqrt{\frac{(A_i^2) - (A_f^2)}{2 \cdot [g] \cdot (h_i - h_o)}}\right)\right)$$

ex
$$0.767462 = \left(\frac{14\text{m}^3/\text{s}}{7.1\text{m}^2 \cdot 1.8\text{m}^2} \cdot \left(\sqrt{\frac{\left((7.1\text{m}^2)^2\right) - \left((1.8\text{m}^2)^2\right)}{2 \cdot [g] \cdot (20\text{m} - 15.1\text{m})}}\right)\right)$$

2) Coefficient of Discharge through Flume given Discharge Flow through Rectangular Channel

Open Calculator

fx
$$C_d = \left(\frac{Q}{A_i \cdot A_f} \cdot \left(\sqrt{\frac{(A_i^2) - (A_f^2)}{2 \cdot [g] \cdot (h_i - h_o)}}\right)\right)$$

ex
$$0.767462 = \left(\frac{14\text{m}^3/\text{s}}{7.1\text{m}^2 \cdot 1.8\text{m}^2} \cdot \left(\sqrt{\frac{\left((7.1\text{m}^2)^2\right) - \left((1.8\text{m}^2)^2\right)}{2 \cdot [g] \cdot (20\text{m} - 15.1\text{m})}}\right)\right)$$

3) Depth of Flow given Discharge through Critical Depth Flume

Open Calculator

fx $$d_f = \left(\frac{Q}{W_t \cdot C_d}\right)^{\frac{2}{3}}$$

ex $$3.324125\text{m} = \left(\frac{14\text{m}^3/\text{s}}{3.5\text{m} \cdot 0.66}\right)^{\frac{2}{3}}$$

4) Discharge Coefficient given Discharge through Critical Depth Flume

Open Calculator

fx $$C_d = \frac{Q}{W_t \cdot \left(d_f^{1.5}\right)}$$

ex $$0.667251 = \frac{14\text{m}^3/\text{s}}{3.5\text{m} \cdot \left((3.3\text{m})^{1.5}\right)}$$

5) Discharge Flow through Channel

Open Calculator

fx $$Q = (C_d \cdot A_i \cdot A_f) \cdot \left(\sqrt{2 \cdot [g] \cdot \frac{h_i - h_o}{\left(A_i^2\right) - \left(A_f^2\right)}}\right)$$

ex

$$12.03969\text{m}^3/\text{s} = (0.66 \cdot 7.1\text{m}^2 \cdot 1.8\text{m}^2) \cdot \left(\sqrt{2 \cdot [g] \cdot \frac{20\text{m} - 15.1\text{m}}{\left((7.1\text{m}^2)^2\right) - \left((1.8\text{m}^2)^2\right)}}\right)$$

6) Discharge Flow through Rectangular Channel

Open Calculator

fx $$Q = (C_d \cdot A_i \cdot A_f) \cdot \left(\sqrt{2 \cdot [g] \cdot \frac{h_i - h_o}{(A_i^2) - (A_f^2)}} \right)$$

ex $$12.03969\text{m}^3/\text{s} = (0.66 \cdot 7.1\text{m}^2 \cdot 1.8\text{m}^2) \cdot \left(\sqrt{2 \cdot [g] \cdot \frac{20\text{m} - 15.1\text{m}}{\left((7.1\text{m}^2)^2\right) - \left((1.8\text{m}^2)^2\right)}} \right)$$

7) Discharge through Critical Depth Flume

Open Calculator

fx $$Q = C_d \cdot W_t \cdot (d_f^{1.5})$$

ex $$13.84787\text{m}^3/\text{s} = 0.66 \cdot 3.5\text{m} \cdot \left((3.3\text{m})^{1.5}\right)$$

8) Head at Entrance given Discharge through Channel

Open Calculator

fx $$h_i = \left(\frac{Q}{C_d \cdot A_i \cdot A_f \cdot \left(\sqrt{2 \cdot \frac{[g]}{A_i^2 - A_f^2}} \right)} \right)^2 + h_o$$

ex $$21.72555\text{m} = \left(\frac{14\text{m}^3/\text{s}}{0.66 \cdot 7.1\text{m}^2 \cdot 1.8\text{m}^2 \cdot \left(\sqrt{2 \cdot \frac{[g]}{(7.1\text{m}^2)^2 - (1.8\text{m}^2)^2}} \right)} \right)^2 + 15.1\text{m}$$

9) Head at Entrance of Section given Discharge Flow through Channel

Open Calculator

$$h_o = h_i - \left(\frac{Q}{C_d \cdot A_i \cdot A_f \cdot \left(\sqrt{2 \cdot \frac{[g]}{A_i^2 - A_f^2}} \right)} \right)^2$$

$$13.37445\text{m} = 20\text{m} - \left(\frac{14\text{m}^3/\text{s}}{0.66 \cdot 7.1\text{m}^2 \cdot 1.8\text{m}^2 \cdot \left(\sqrt{2 \cdot \frac{[g]}{(7.1\text{m}^2)^2 - (1.8\text{m}^2)^2}} \right)} \right)^2$$

10) Width of Throat given Discharge through Critical Depth Flume

Open Calculator

$$W_t = \frac{Q}{C_d \cdot \left(d_f^{1.5} \right)}$$

$$3.538451\text{m} = \frac{14\text{m}^3/\text{s}}{0.66 \cdot \left((3.3\text{m})^{1.5} \right)}$$

Momentum in Open Channel Flow Specific Force

11) Specific Force

Open Calculator

$$F = \left(Q \cdot \frac{Q}{A_{cs} \cdot [g]} \right) + A_{cs} \cdot Y_t$$

$$304.3324\text{m}^3 = \left(14\text{m}^3/\text{s} \cdot \frac{14\text{m}^3/\text{s}}{15\text{m}^2 \cdot [g]} \right) + 15\text{m}^2 \cdot 20.2\text{m}$$

12) Specific Force given Top Width

Open Calculator

fx $$F = \left(\frac{A_{cs}^{2}}{T}\right) + A_{cs} \cdot Y_{t}$$

ex $$410.1429\text{m}^3 = \left(\frac{(15\text{m}^2)^{2}}{2.1\text{m}}\right) + 15\text{m}^2 \cdot 20.2\text{m}$$

13) Top Width given Specific Force

Open Calculator

fx $$T = \frac{A_{cs}^{2}}{F - A_{cs} \cdot Y_{t}}$$

ex $$2.102804\text{m} = \frac{(15\text{m}^2)^{2}}{410\text{m}^3 - 15\text{m}^2 \cdot 20.2\text{m}}$$

14) Vertical Depth of Centroid of Area given Specific Force

Open Calculator

fx $$Y_{t} = \frac{F - \left(Q \cdot \frac{Q}{A_{cs} \cdot [g]}\right)}{A_{cs}}$$

ex $$27.2445\text{m} = \frac{410\text{m}^3 - \left(14\text{m}^3/\text{s} \cdot \frac{14\text{m}^3/\text{s}}{15\text{m}^2 \cdot [g]}\right)}{15\text{m}^2}$$

15) Vertical Depth of Centroid of Area given Specific Force with Top Width

Open Calculator

$$Y_t = \frac{F - \left(\frac{A_{cs}^2}{T}\right)}{A_{cs}}$$

$$20.19048\text{m} = \frac{410\text{m}^3 - \left(\frac{(15\text{m}^2)^2}{2.1\text{m}}\right)}{15\text{m}^2}$$

Variables Used

- **A_{cs}** Cross-Sectional Area of Channel *(Square Meter)*
- **A_f** Cross Section Area 2 *(Square Meter)*
- **A_i** Cross Section Area 1 *(Square Meter)*
- **C_d** Coefficient of Discharge
- **d_f** Depth of Flow *(Meter)*
- **F** Specific Force in OCF *(Cubic Meter)*
- **h_i** Loss of Head at Entrance *(Meter)*
- **h_o** Loss of Head at Exit *(Meter)*
- **Q** Discharge of Channel *(Cubic Meter per Second)*
- **T** Top Width *(Meter)*
- **W_t** Width of Throat *(Meter)*
- **Y_t** Distance from Centroidal *(Meter)*

Constants, Functions, Measurements used

- Constant: **[g]**, 9.80665
  Gravitational acceleration on Earth
- 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 Meter (m)
  Length Unit Conversion
- Measurement: **Volume** in Cubic Meter (m³)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
  Volumetric Flow Rate Unit Conversion

Check other formula lists

- **Computation of Uniform Flow Formulas**
- **Critical Flow and its Computation Formulas**
- **Geometrical Properties of Channel Section Formulas**
- **Metering Flumes and Momentum in Open Channel Flow Specific Force Formulas**
- **Specific Energy and Critical Depth Formulas**

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