





Metering Flumes and Momentum in Open-Channel Flow Specific Force Formulas

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

Metering Flumes and Momentum in Open-Channel Flow Specific Force ☑

Metering Flumes

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

$$\mathbf{E} \mathbf{C}_{d} = \left(\frac{\mathbf{Q}}{\mathbf{A}_{i} \cdot \mathbf{A}_{f}} \cdot \left(\sqrt{\frac{\left(\mathbf{A}_{i}^{2}\right) - \left(\mathbf{A}_{f}^{2}\right)}{2 \cdot [g] \cdot \left(\mathbf{h}_{i} - \mathbf{h}_{o}\right)}} \right) \right)$$

Open Calculator

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

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

$$\boxed{\mathbf{C}_{d} = \left(\frac{Q}{A_{i} \cdot A_{f}} \cdot \left(\sqrt{\frac{\left(A_{i}^{2}\right) - \left(A_{f}^{2}\right)}{2 \cdot [g] \cdot \left(h_{i} - h_{o}\right)}}\right)\right)}$$

Open Calculator 🗗





3) Depth of Flow given Discharge through Critical Depth Flume

 $\mathbf{K} d_{\mathrm{f}} = \left(rac{\mathrm{Q}}{\mathrm{W_{t} \cdot C_{d}}}
ight)^{rac{2}{3}}$

Open Calculator 🗗

= $3.324125 \mathrm{m} = \left(rac{14 \mathrm{m}^3/\mathrm{s}}{3.5 \mathrm{m} \cdot 0.66}
ight)^{rac{2}{3}}$

4) Discharge Coefficient given Discharge through Critical Depth Flume

 $\mathbf{K} \, \mathrm{C_d} = rac{\mathrm{Q}}{\mathrm{W_t \cdot \left(\mathrm{d_f^{1.5}}
ight)}}$

Open Calculator 🗗

 $oxed{ex} 0.667251 = rac{14 \mathrm{m}^3/\mathrm{s}}{3.5 \mathrm{m} \cdot \left((3.3 \mathrm{m})^{1.5}
ight)}$

5) Discharge Flow through Channel

 $\mathbf{Q} = \left(\mathrm{C_d} \cdot \mathrm{A_i} \cdot \mathrm{A_f}
ight) \cdot \left(\sqrt{2 \cdot [\mathrm{g}] \cdot rac{\mathrm{h_i} - \mathrm{h_o}}{\left(\mathrm{A_i^2}
ight) - \left(\mathrm{A_f^2}
ight)}}
ight)$

Open Calculator

ex

$$oxed{12.03969 ext{m}^3/ ext{s} = (0.66 \cdot 7.1 ext{m}^2 \cdot 1.8 ext{m}^2) \cdot \left(\sqrt{2 \cdot ext{[g]} \cdot rac{20 ext{m} - 15.1 ext{m}}{\left((7.1 ext{m}^2)^2
ight) - \left((1.8 ext{m}^2)^2
ight)}}
ight)}$$





6) Discharge Flow through Rectangular Channel

 $\mathbf{Q} = (\mathrm{C_d} \cdot \mathrm{A_i} \cdot \mathrm{A_f}) \cdot \left(\sqrt{2 \cdot [\mathrm{g}] \cdot rac{\mathrm{h_i} - \mathrm{h_o}}{(\mathrm{A_c^2}) - (\mathrm{A_c^2})}}
ight)$

Open Calculator

ех

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

7) Discharge through Critical Depth Flume

 $\mathbf{K} \, \mathrm{Q} = \mathrm{C}_\mathrm{d} \cdot \mathrm{W}_\mathrm{t} \cdot \left(\mathrm{d}_\mathrm{f}^{1.5}
ight)$

Open Calculator

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

8) Head at Entrance given Discharge through Channel

$$\mathbf{h}_i = \left(rac{Q}{C_d \cdot A_i \cdot A_f \cdot \left(\sqrt{2 \cdot rac{[g]}{A_i^2 - A_f^2}}
ight)}
ight) \ + h_o$$



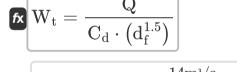
9) Head at Entrance of Section given Discharge Flow through Channel

 $\mathbf{f}_{\mathrm{o}} = \mathrm{h_{i}} - \left(rac{\mathrm{Q}}{\mathrm{C_{d} \cdot A_{i} \cdot A_{f} \cdot \left(\sqrt{2 \cdot rac{[g]}{A_{i}^{2} - A_{f}^{2}}}
ight)}}
ight)^{2}$

Open Calculator

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

10) Width of Throat given Discharge through Critical Depth Flume



Open Calculator 🗗

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

Momentum in Open-Channel Flow-Specific Force

11) Specific Force

$$\mathbf{F} = \left(\mathbf{Q} \cdot rac{\mathbf{Q}}{\mathbf{A}_{cs} \cdot [\mathbf{g}]}
ight) + \mathbf{A}_{cs} \cdot \mathbf{Y}_{t}$$

Open Calculator 🗗





12) Specific Force given Top Width

 $F = \left(rac{A_{
m cs}^2}{T}
ight) + A_{
m cs} \cdot Y_{
m t}$

Open Calculator 🗗

 $oxed{410.1429 \mathrm{m}^{_3} = \left(rac{\left(15 \mathrm{m}^2
ight)^2}{2.1 \mathrm{m}}
ight) + 15 \mathrm{m}^2 \cdot 20.2 \mathrm{m}}$

13) Top Width given Specific Force

 $ag{F} = rac{A_{cs}^2}{F - A_{cs} \cdot Y_t}$

Open Calculator

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

14) Vertical Depth of Centroid of Area given Specific Force

 $\mathbf{Y}_{\mathrm{t}} = rac{\mathrm{F} - \left(\mathrm{Q} \cdot rac{\mathrm{Q}}{\mathrm{A}_{\mathrm{cs}} \cdot [\mathrm{g}]}
ight)}{\mathrm{A}_{\mathrm{cs}}}$

Open Calculator

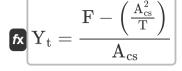
 $extbf{ex} 27.2445 ext{m} = rac{410 ext{m}^3 - \left(14 ext{m}^3/ ext{s} \cdot rac{14 ext{m}^3/ ext{s}}{15 ext{m}^2 \cdot [ext{g}]}
ight)}{15 ext{m}^2}$



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



Open Calculator 🚰



ex
$$20.19048 \mathrm{m} = rac{410 \mathrm{m}^3 - \left(rac{(15 \mathrm{m}^2)^2}{2.1 \mathrm{m}}
ight)}{15 \mathrm{m}^2}$$



Variables Used

- A_{cs} Cross-Sectional Area of Channel (Square Meter)
- Af Cross Section Area 2 (Square Meter)
- A_i Cross Section Area 1 (Square Meter)
- Cd 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)
- Wt Width of Throat (Meter)
- Y_t Distance from Centroidal (Meter)





Constants, Functions, Measurements used

- Constant: [g], 9.80665 Meter/Second² Gravitational acceleration on Earth
- Function: sqrt, sqrt(Number) Square root function
- 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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