



Flow Regime Formulas

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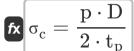
Open Calculator G

Open Calculator

List of 17 Flow Regime Formulas

Flow Regime **G**

1) Circumferential stress developed in pipe wall



 $ext{ex} 6.8 ext{E^7N/m^2} = rac{1.7 ext{E^7N/m^2} \cdot 0.12 ext{m}}{2 \cdot 0.015 ext{m}}$

2) Coefficient of contraction for sudden contraction

 $ext{C}_{ ext{c}} = rac{\overline{ ext{V}_{2}}'}{(ext{V}_{2}') + \sqrt{ ext{h}_{ ext{c}} \cdot 2 \cdot [ext{g}]}}$

 $ext{ex} 0.599533 = rac{2.89 ext{m/s}}{2.89 ext{m/s} + \sqrt{0.19 ext{m} \cdot 2 \cdot [ext{g}]}}$

3) Discharge in Equivalent Pipe 🗗

 $\mathbf{Q} = \sqrt{rac{\mathrm{H_l} \cdot (\pi^2) \cdot 2 \cdot \left(\mathrm{D_{eq}^5}
ight) \cdot [\mathrm{g}]}{4 \cdot 16 \cdot \mu \cdot \mathrm{L}}}$

 $0.02483 \mathrm{m}^3/\mathrm{s} = \sqrt{rac{20 \mathrm{m} \cdot (\pi^2) \cdot 2 \cdot \left((0.165 \mathrm{m})^5
ight) \cdot [\mathrm{g}]}{4 \cdot 16 \cdot 0.01 \cdot 1200 \mathrm{m}}}$



4) Force required to accelerate water in pipe

fx $F = M_w \cdot a_1$

Open Calculator

ex $0.0925 \mathrm{N} = 0.05 \mathrm{kg} \cdot 1.85 \mathrm{m/s^2}$

5) Longitudinal Stress developed in Pipe wall

 $\sigma_{
m l} = rac{{
m p}\cdot{
m D}}{4\cdot{
m t}_{
m p}}$

Open Calculator

 $oxed{ex} 3.4 ext{E}^7 ext{N/m}^2 = rac{1.7 ext{E}^7 ext{N/m}^2 \cdot 0.12 ext{m}}{4 \cdot 0.015 ext{m}}$

6) Retarding force for gradual closure of valves

 $\mathbf{F}_{\mathrm{r}} =
ho' \cdot \mathbf{A} \cdot \mathbf{L} \cdot rac{\mathrm{V_f}}{\mathrm{t_c}}$

Open Calculator 🗗

ex $319.889 \mathrm{N} = 1010 \mathrm{kg/m^3 \cdot 0.0113m^2 \cdot 1200m \cdot \frac{12.5 \mathrm{m/s}}{535.17 \mathrm{s}}}$

7) Time required to close Valve for Gradual Closure of Valves

 $\mathbf{f}_{\mathrm{c}} = rac{
ho' \cdot \mathrm{L} \cdot \mathrm{V}_{\mathrm{f}}}{\mathsf{I}} \Big|$

Open Calculator 🗗

 $ag{535.7143s} = rac{1010 ext{kg/m}^3 \cdot 1200 ext{m} \cdot 12.5 ext{m/s}}{28280 ext{N/m}^2}$



Open Calculator 2

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8) Time taken by pressure wave to travel

fx $t=2\cdotrac{L}{C}$

ex $125.6545s = 2 \cdot \frac{1200m}{19.1m/s}$

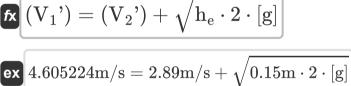
9) Velocity at Outlet for Head Loss at Exit of Pipe

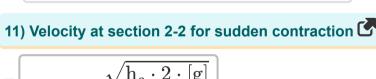
fx $v = \sqrt{h_o \cdot 2 \cdot [g]}$

ex $12.49487 ext{m/s} = \sqrt{7.96 ext{m} \cdot 2 \cdot [ext{g}]}$

10) Velocity at section 1-1 for sudden enlargement

 $oldsymbol{\kappa}({
m V_1'}) = ({
m V_2'}) + \sqrt{{
m h_e} \cdot 2 \cdot [{
m g}]}$





 $extbf{(V_2')} = rac{\sqrt{ ext{h}_{ ext{c}} \cdot 2 \cdot [ext{g}]}}{\left(rac{1}{G}
ight) - 1}$

ex
$$2.895632 ext{m/s} = rac{\sqrt{0.19 ext{m} \cdot 2 \cdot [ext{g}]}}{\left(rac{1}{0.6}
ight) - 1}$$





12) Velocity at section 2-2 for sudden enlargement 🗗

 $oldsymbol{\kappa}(\mathrm{V_2'}) = (\mathrm{V_1'}) - \sqrt{\mathrm{h_e} \cdot 2 \cdot [\mathrm{g}]}$

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(- / (1 / V) (6)

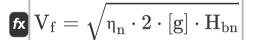
 $= 2.464776 ext{m/s} = 4.18 ext{m/s} - \sqrt{0.15 ext{m} \cdot 2 \cdot ext{[g]}}$

13) Velocity of Flow at Outlet of Nozzle

$$extbf{V}_f = \sqrt{2 \cdot [g] \cdot rac{H_{bn}}{1 + \left(4 \cdot \mu \cdot L \cdot rac{a_2^2}{D \cdot (A^2)}
ight)}}$$

Open Calculator

14) Velocity of Flow at outlet of Nozzle for Efficiency and Head



Open Calculator

 $\mathbf{ex} \ 21.14671 \mathrm{m/s} = \sqrt{0.8 \cdot 2 \cdot [\mathrm{g}] \cdot 28.5 \mathrm{m}}$



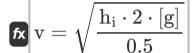
15) Velocity of Fluid for Head Loss due to Obstruction in Pipe

$$V_{\mathrm{f}} = rac{\sqrt{\mathrm{H_o} \cdot 2 \cdot [\mathrm{g}]}}{\left(rac{\mathrm{A}}{\mathrm{C_c \cdot (\mathrm{A-A'})}}
ight) - 1}$$

Open Calculator 2

$$= \frac{\sqrt{7.36 \text{m} \cdot 2 \cdot [\text{g}]}}{\left(\frac{0.0113 \text{m}^2}{0.6 \cdot (0.0113 \text{m}^2 - 0.0017 \text{m})}\right) - 1}$$

16) Velocity of fluid in pipe for head loss at entrance of pipe



Open Calculator

ex
$$12.49487 ext{m/s} = \sqrt{rac{3.98 ext{m} \cdot 2 \cdot [ext{g}]}{0.5}}$$

17) Velocity of liquid at vena-contracta

$$V_{c} = rac{A \cdot V_{f}}{C_{c} \cdot (A - A')}$$

Open Calculator

$$ext{ex} \left[24.52257 ext{m/s} = rac{0.0113 ext{m}^2 \cdot 12.5 ext{m/s}}{0.6 \cdot (0.0113 ext{m}^2 - 0.0017 ext{m})}
ight]$$



Variables Used

- A Cross Sectional Area of Pipe (Square Meter)
- A' Maximum Area of Obstruction (Meter)
- a₂ Nozzle Area at Outlet (Square Meter)
- a_I Acceleration of Liquid (Meter per Square Second)
- C Velocity of Pressure Wave (Meter per Second)
- C_c Coefficient of Contraction in Pipe
- D Diameter of Pipe (Meter)
- Deg Diameter of Equivalent Pipe (Meter)
- F Force (Newton)
- **F**_r Retarding Force on Liquid in Pipe (Newton)
- H_{bn} Head at Base of Nozzle (Meter)
- h_c Loss of Head Sudden Contraction (Meter)
- h_e Loss of Head Sudden Enlargement (Meter)
- h_i Head Loss at Pipe Entrance (Meter)
- H_I Loss of Head in Equivalent Pipe (Meter)
- h_o Head Loss at Pipe Exit (Meter)
- H_o Loss of Head Due to Obstruction in Pipe (Meter)
- I Intensity of Pressure of Wave (Newton per Square Meter)
- L Length of Pipe (Meter)
- **M**_w Mass of Water (Kilogram)
- p Pressure Rise at Valve (Newton per Square Meter)
- Q Discharge through Pipe (Cubic Meter per Second)



- t Time Taken to Travel (Second)
- t_c Time Required to Close Valve (Second)
- t_p Thickness of Liquid Carrying Pipe (Meter)
- **V** Velocity (Meter per Second)
- V₁' Velocity of Fluid at Section 1 (Meter per Second)
- V2' Velocity of Fluid at Section 2 (Meter per Second)
- V_c Velocity of Liquid Vena Contracta (Meter per Second)
- **V**_f Flow Velocity through Pipe (Meter per Second)
- η_n Efficiency for Nozzle
- µ Coefficient of Friction of Pipe
- ρ' Density of Fluid Inside the Pipe (Kilogram per Cubic Meter)
- σ_c Circumferential Stress (Newton per Square Meter)
- σ_I Longitudinal Stress (Newton per Square Meter)





Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- 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: Weight in Kilogram (kg)
 Weight Unit Conversion
- Measurement: Time in Second (s)

 Time Unit Conversion
- Measurement: Area in Square Meter (m²)
 Area Unit Conversion
- Measurement: Pressure in Newton per Square Meter (N/m²)
 Pressure 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: Force in Newton (N)
 Force Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/s)
 Volumetric Flow Rate Unit Conversion





- Measurement: Density in Kilogram per Cubic Meter (kg/m³)

 Density Unit Conversion
- Measurement: Stress in Newton per Square Meter (N/m²)

 Stress Unit Conversion





Check other formula lists

Flow Regime Formulas

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