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Hydrostatics Formulas

Calculators! Examples! Conversions!

List of 28 Hydrostatics Formulas

Hydrostatics

1) Coordinate measured Downward from Top given Effective Tension

Open Calculator

fx $$z = -\left(\frac{T_e}{(\rho_s - \rho_m) \cdot [g] \cdot A_s} - L\right)$$

ex $$5.999994 = -\left(\frac{402.22\text{kN}}{(7750\text{kg/m}^3 - 1440\text{kg/m}^3) \cdot [g] \cdot 0.65\text{m}^2} - 16\text{m}\right)$$

2) Coordinate measured Downward from Top given Tension on Vertical Drill String

Open Calculator

fx $$z = -\left(\left(\frac{T}{\rho_s \cdot [g] \cdot A_s}\right) - L\right)$$

ex $$6 = -\left(\left(\frac{494.01\text{kN}}{7750\text{kg/m}^3 \cdot [g] \cdot 0.65\text{m}^2}\right) - 16\text{m}\right)$$

3) Cross Section Area of Steel given Effective Tension

Open Calculator

fx $$A_s = \frac{T_e}{(\rho_s - \rho_m) \cdot [g] \cdot (L - z)}$$

ex $$0.65\text{m}^2 = \frac{402.22\text{kN}}{(7750\text{kg/m}^3 - 1440\text{kg/m}^3) \cdot [g] \cdot (16\text{m} - 6)}$$

4) Cross Section Area of Steel in Pipe given Tension on Vertical Drill String

Open Calculator

$$A_s = \frac{T}{\rho_s \cdot [g] \cdot (L - z)}$$

$$0.65\text{m}^2 = \frac{494.01\text{kN}}{7750\text{kg/m}^3 \cdot [g] \cdot (16\text{m} - 6)}$$

5) Effective Tension given Buoyant Force acts in Direction opposite to Gravity Force

Open Calculator

$$T_e = (\rho_s - \rho_m) \cdot [g] \cdot A_s \cdot (L - z)$$

$$402.2197\text{kN} = (7750\text{kg/m}^3 - 1440\text{kg/m}^3) \cdot [g] \cdot 0.65\text{m}^2 \cdot (16\text{m} - 6)$$

6) Length of Pipe Hanging given Lower Section of Drill String Length in Compression

Open Calculator

$$L = \frac{L_c \cdot \rho_s}{\rho_m}$$

$$15.98438\text{m} = \frac{2.97 \cdot 7750\text{kg/m}^3}{1440\text{kg/m}^3}$$

7) Length of Pipe Hanging in Well given Effective Tension

Open Calculator

fx $$L = \left(\left(\frac{T_e}{(\rho_s - \rho_m) \cdot [g] \cdot A_s} + z\right)\right)$$

ex $$16.00001\text{m} = \left(\left(\frac{402.22\text{kN}}{(7750\text{kg/m}^3 - 1440\text{kg/m}^3) \cdot [g] \cdot 0.65\text{m}^2} + 6\right)\right)$$

8) Length of Pipe Hanging in Well given Tension on Vertical Drill String

Open Calculator

fx $$L = \left(\frac{T}{\rho_s \cdot [g] \cdot A_s}\right) + z$$

ex $$16\text{m} = \left(\frac{494.01\text{kN}}{7750\text{kg/m}^3 \cdot [g] \cdot 0.65\text{m}^2}\right) + 6$$

9) Length of Pipe Hanging in Well given Vertical Force at Bottom End of Drill String

Open Calculator

fx $$L = \frac{f_z}{\rho_m \cdot [g] \cdot A_s}$$

ex $$15.99952\text{m} = \frac{146.86\text{kN}}{1440\text{kg/m}^3 \cdot [g] \cdot 0.65\text{m}^2}$$

10) Lower Section of Drill String Length that is in Compression

Open Calculator

fx $$L_c = \frac{\rho_m \cdot L}{\rho_s}$$

ex $$2.972903 = \frac{1440\text{kg/m}^3 \cdot 16\text{m}}{7750\text{kg/m}^3}$$

11) Mass Density of Drilling Mud for Lower Section of Drill String Length in Compression

Open Calculator

fx $$\rho_m = \frac{L_c \cdot \rho_s}{L}$$

ex $$1438.594\text{kg/m}^3 = \frac{2.97 \cdot 7750\text{kg/m}^3}{16\text{m}}$$

12) Mass Density of Drilling Mud given Vertical Force at Bottom End of Drill String

Open Calculator

fx $$\rho_m = \frac{f_z}{[g] \cdot A_s \cdot L}$$

ex $$1439.957\text{kg/m}^3 = \frac{146.86\text{kN}}{[g] \cdot 0.65\text{m}^2 \cdot 16\text{m}}$$

13) Mass Density of Drilling Mud when Buoyant Force acts in Direction opposite to Gravity Force

Open Calculator

fx $$\rho_m = -\left(\left(\frac{T_e}{[g] \cdot A_s \cdot (L - z)} - \rho_s\right)\right)$$

ex $$1439.996\text{kg/m}^3 = -\left(\left(\frac{402.22\text{kN}}{[g] \cdot 0.65\text{m}^2 \cdot (16\text{m} - 6)} - 7750\text{kg/m}^3\right)\right)$$

14) Mass Density of Steel for Lower Section of Drill String Length in Compression

Open Calculator

fx $$\rho_s = \frac{\rho_m \cdot L}{L_c}$$

ex $$7757.576\text{kg/m}^3 = \frac{1440\text{kg/m}^3 \cdot 16\text{m}}{2.97}$$

15) Mass Density of Steel for Tension on Vertical Drill String

Open Calculator

fx $$\rho_s = \frac{T}{[g] \cdot A_s \cdot (L - z)}$$

ex $$7750\text{kg/m}^3 = \frac{494.01\text{kN}}{[g] \cdot 0.65\text{m}^2 \cdot (16\text{m} - 6)}$$

16) Mass Density of Steel when Buoyant Force acts in Direction opposite to Gravity Force

Open Calculator

fx $$\rho_s = \left(\frac{T_e}{[g] \cdot A_s \cdot (L - z)} + \rho_m \right)$$

ex $$7750.004\text{kg/m}^3 = \left(\frac{402.22\text{kN}}{[g] \cdot 0.65\text{m}^2 \cdot (16\text{m} - 6)} + 1440\text{kg/m}^3 \right)$$

17) Tension on Vertical Drill String

Open Calculator

fx $$T = \rho_s \cdot [g] \cdot A_s \cdot (L - z)$$

ex $$494.01\text{kN} = 7750\text{kg/m}^3 \cdot [g] \cdot 0.65\text{m}^2 \cdot (16\text{m} - 6)$$

18) Vertical Force at Bottom End of Drill String

Open Calculator

fx $$f_z = \rho_m \cdot [g] \cdot A_s \cdot L$$

ex $$146.8644\text{kN} = 1440\text{kg/m}^3 \cdot [g] \cdot 0.65\text{m}^2 \cdot 16\text{m}$$

Static Loads

Archimedes Law and Buoyancy

19) Buoyant Force of Body Submerged in Fluid

Open Calculator

fx $$F_B = \nabla \cdot \rho \cdot [g]$$

ex $$4888.615\text{N} = 0.5\text{m}^3 \cdot 997\text{kg/m}^3 \cdot [g]$$

20) Mass Density of Fluid for Buoyant Force Submerged in Fluid

Open Calculator

fx $$\rho = \frac{F_B}{[g] \cdot \nabla}$$

ex $$997\text{kg/m}^3 = \frac{4888.615\text{N}}{[g] \cdot 0.5\text{m}^3}$$

21) Volume of Submerged Part of Object given Buoyant Force of Body Submerged in Fluid

Open Calculator

fx $$\nabla = \frac{F_B}{\rho \cdot [g]}$$

ex $$0.5\text{m}^3 = \frac{4888.615\text{N}}{997\text{kg/m}^3 \cdot [g]}$$

Drill String Buckling

22) Column Slenderness Ratio for Critical Buckling Load

Open Calculator

fx $$Lcr_{ratio} = \sqrt{\frac{A \cdot \pi^2 \cdot E}{P_{cr}}}$$

ex $$160 = \sqrt{\frac{0.0688\text{m}^2 \cdot \pi^2 \cdot 2\text{E}11\text{N/m}^2}{5304.912\text{kN}}}$$

23) Critical Buckling Load

Open Calculator

fx $$P_{cr} = A \cdot \left(\frac{\pi^2 \cdot E}{Lcr_{ratio}^2} \right)$$

ex $$5304.912\text{kN} = 0.0688\text{m}^2 \cdot \left(\frac{\pi^2 \cdot 2\text{E}11\text{N/m}^2}{(160)^2} \right)$$

24) Cross Section Area of Column for Critical Buckling Load

Open Calculator

fx $$A = \frac{P_{cr} \cdot Lcr_{ratio}^2}{\pi^2 \cdot E}$$

ex $$0.0688\text{m}^2 = \frac{5304.912\text{kN} \cdot (160)^2}{\pi^2 \cdot 2\text{E}11\text{N/m}^2}$$

25) Flow Velocity given Reynolds Number in Shorter Length of Pipe

Open Calculator

fx $$V_f = \frac{Re \cdot v}{D_p}$$

ex $$1.119802\text{m/s} = \frac{1560 \cdot 7.25\text{St}}{1.01\text{m}}$$

26) Kinematic Viscosity of Fluid given Reynolds Number in Shorter Length of Pipe

Open Calculator

fx $$v = \frac{V_f \cdot D_p}{Re}$$

ex $$7.251282\text{St} = \frac{1.12\text{m/s} \cdot 1.01\text{m}}{1560}$$

27) Pipe Diameter given Reynolds Number in Shorter Length of Pipe

Open Calculator

fx $$D_p = \frac{Re \cdot v}{V_f}$$

ex $$1.009821\text{m} = \frac{1560 \cdot 7.25\text{St}}{1.12\text{m/s}}$$

28) Reynolds Number in Shorter Length of Pipe

Open Calculator

fx $$Re = \frac{V_f \cdot D_p}{v}$$

ex $$1560.276 = \frac{1.12\text{m/s} \cdot 1.01\text{m}}{7.25\text{St}}$$

Variables Used

- ∇ Volume of Submerged part of Object *(Cubic Meter)*
- A Cross Section Area of Column *(Square Meter)*
- A_s Cross Section Area of Steel in Pipe *(Square Meter)*
- D_p Diameter of Pipe *(Meter)*
- E Elastic Modulus *(Newton per Square Meter)*
- F_B Buoyant Force *(Newton)*
- f_z Vertical Force at Bottom end of Drill String *(Kilonewton)*
- L Length of Pipe Hanging in Well *(Meter)*
- L_c Lower Section of Drill String Length
- Lcr_{ratio} Column Slenderness Ratio
- P_{cr} Critical Buckling Load for Drill String *(Kilonewton)*
- Re Reynolds Number
- T Tension on Vertical Drill String *(Kilonewton)*
- T_e Effective Tension *(Kilonewton)*
- v Kinematic Viscosity *(Stokes)*
- V_f Flow Velocity *(Meter per Second)*
- z Coordinate measured Downward from Top
- ρ Mass Density *(Kilogram per Cubic Meter)*
- ρ_m Density of Drilling Mud *(Kilogram per Cubic Meter)*
- ρ_s Mass Density of Steel *(Kilogram per Cubic 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: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Force** in Kilonewton (kN), Newton (N)
  Force Unit Conversion
- Measurement: **Mass Concentration** in Kilogram per Cubic Meter (kg/m^3)
  Mass Concentration Unit Conversion
- Measurement: **Kinematic Viscosity** in Stokes (St)
  Kinematic Viscosity Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m^3)
  Density Unit Conversion
- Measurement: **Stress** in Newton per Square Meter (N/m^2)
  Stress Unit Conversion

Check other formula lists

- Hydrostatics Formulas

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