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Settling Velocity Formulas

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List of 17 Settling Velocity Formulas

Settling Velocity

1) Settling Velocity

[Open Calculator !\[\]\(339a16584d5da0f0a3ca4e9ec17bf6a1_img.jpg\)](#)

$$fx \quad v_s = \sqrt{\frac{4 \cdot [g] \cdot (\rho_m - \rho_f) \cdot d}{3 \cdot C_D \cdot \rho_f}}$$

$$ex \quad 0.004907\text{m/s} = \sqrt{\frac{4 \cdot [g] \cdot (2700\text{kg/m}^3 - 1000\text{kg/m}^3) \cdot 0.0013\text{m}}{3 \cdot 1200 \cdot 1000\text{kg/m}^3}}$$

2) Settling Velocity at 10 degree Celsius

[Open Calculator !\[\]\(6059a5aa8b4ca7bb793408023d6c6e42_img.jpg\)](#)

$$fx \quad v_s = 418 \cdot (G_s - G_w) \cdot d^2$$

$$ex \quad 0.0012\text{m/s} = 418 \cdot (2.7 - 1.001) \cdot (0.0013\text{m})^2$$

3) Settling Velocity given Celsius for Diameter greater than 0.1mm

[Open Calculator !\[\]\(e3275251d0893157c3584e20c81dc3ba_img.jpg\)](#)

$$fx \quad v_s = (418 \cdot (G_s - G_w) \cdot d) \cdot \frac{3 \cdot t + 70}{100}$$

$$ex \quad 9.208823\text{m/s} = (418 \cdot (2.7 - 1.001) \cdot 0.0013\text{m}) \cdot \frac{3 \cdot 36^\circ\text{C} + 70}{100}$$




4) Settling Velocity given Degree Celsius 

$$fx \quad v_s = 418 \cdot (G_s - G_w) \cdot d^2 \cdot \left(\frac{3 \cdot t + 70}{100} \right)$$

Open Calculator 

$$ex \quad 0.011971\text{m/s} = 418 \cdot (2.7 - 1.001) \cdot (0.0013\text{m})^2 \cdot \left(\frac{3 \cdot 36^\circ\text{C} + 70}{100} \right)$$

5) Settling Velocity given Displacement Velocity for Fine Particles 

$$fx \quad v_s = \frac{v_d}{\sqrt{\frac{8}{f}}}$$

Open Calculator 

$$ex \quad 0.0072\text{m/s} = \frac{0.0288\text{m/s}}{\sqrt{\frac{8}{0.5}}}$$

6) Settling Velocity given Displacement Velocity with Settling Velocity 

$$fx \quad v_s = \frac{v_d}{18}$$

Open Calculator 

$$ex \quad 0.0016\text{m/s} = \frac{0.0288\text{m/s}}{18}$$



7) Settling Velocity given Drag Force as per Stokes Law

$$fx \quad v_s = \frac{F_D}{3 \cdot \pi \cdot \mu_{\text{viscosity}} \cdot d}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 0.32007\text{m/s} = \frac{0.004\text{N}}{3 \cdot \pi \cdot 10.2\text{P} \cdot 0.0013\text{m}}$$

8) Settling Velocity given Frictional Drag

$$fx \quad v_s = \sqrt{\frac{2 \cdot F_D}{a \cdot C_D \cdot \rho_f}}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 0.071067\text{m/s} = \sqrt{\frac{2 \cdot 0.004\text{N}}{1.32\text{mm}^2 \cdot 1200 \cdot 1000\text{kg/m}^3}}$$

9) Settling Velocity given Height at Outlet Zone with respect to Settling Velocity

$$fx \quad v_s = v' \cdot \frac{h}{H}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 0.03\text{m/s} = 0.1\text{m/s} \cdot \frac{12000\text{mm}}{40\text{m}}$$



10) Settling Velocity given Particle Reynold's Number

$$\text{fx } v_s = \frac{\mu_{\text{viscosity}} \cdot \text{Re}}{\rho_f \cdot d}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$\text{ex } 0.015692\text{m/s} = \frac{10.2\text{P} \cdot 0.02}{1000\text{kg/m}^3 \cdot 0.0013\text{m}}$$

11) Settling Velocity given Ratio of Removal with respect to Settling Velocity

$$\text{fx } v_s = \frac{v'}{R_r}$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$\text{ex } 1.25\text{m/s} = \frac{0.1\text{m/s}}{0.08}$$

12) Settling Velocity given Specific Gravity of Particle and Viscosity

$$\text{fx } v_s = \frac{[g] \cdot (G_s - 1) \cdot d^2}{18 \cdot \nu}$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

$$\text{ex } 0.002159\text{m/s} = \frac{[g] \cdot (2.7 - 1) \cdot (0.0013\text{m})^2}{18 \cdot 7.25\text{St}}$$



13) Settling Velocity using Temperature in Fahrenheit

$$fx \quad v_s = 418 \cdot (G_s - G_w) \cdot d^2 \cdot \left(\frac{T_F + 10}{60} \right)$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

$$ex \quad 0.002136\text{m/s} = 418 \cdot (2.7 - 1.001) \cdot (0.0013\text{m})^2 \cdot \left(\frac{96.8^\circ\text{F} + 10}{60} \right)$$

14) Settling Velocity with respect to Dynamic Viscosity

$$fx \quad v_s = \frac{[g] \cdot (\rho_m - \rho_f) \cdot d^2}{18 \cdot \mu_{\text{viscosity}}}$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5_img.jpg\)](#)

$$ex \quad 0.001535\text{m/s} = \frac{[g] \cdot (2700\text{kg/m}^3 - 1000\text{kg/m}^3) \cdot (0.0013\text{m})^2}{18 \cdot 10.2\text{P}}$$

15) Settling Velocity with respect to Kinematic Viscosity

$$fx \quad v_s = \frac{[g] \cdot (G_s - G_w) \cdot d^2}{18 \cdot \nu}$$

[Open Calculator !\[\]\(ab4e2b3fc7e7887b7a72f548aa6f5e60_img.jpg\)](#)

$$ex \quad 0.002158\text{m/s} = \frac{[g] \cdot (2.7 - 1.001) \cdot (0.0013\text{m})^2}{18 \cdot 7.25\text{St}}$$



16) Settling Velocity with respect to Specific Gravity of Particle **fx**

$$v_s = \sqrt{\frac{4 \cdot [g] \cdot (G_s - 1) \cdot d}{3 \cdot C_D}}$$

Open Calculator **ex**

$$0.004907\text{m/s} = \sqrt{\frac{4 \cdot [g] \cdot (2.7 - 1) \cdot 0.0013\text{m}}{3 \cdot 1200}}$$

17) Surface Loading with respect to Settling Velocity **fx**

$$R = 864000 \cdot v_s$$

Open Calculator **ex**

$$1382.4 = 864000 \cdot 0.0016\text{m/s}$$












Variables Used

- **a** Projected Area of A Particle (*Square Millimeter*)
- **C_D** Drag Coefficient
- **d** Diameter of a Spherical Particle (*Meter*)
- **f** Darcy Friction Factor
- **F_D** Drag Force (*Newton*)
- **G_S** Specific Gravity of Spherical Particle
- **G_w** Specific Gravity of Fluid
- **h** Height of Crack (*Millimeter*)
- **H** Outer Height (*Meter*)
- **R** Surface Loading Rate
- **R_r** Removal Ratio
- **Re** Reynold Number
- **t** Temperature in Centigrade (*Celsius*)
- **T_F** Temperature in Fahrenheit (*Fahrenheit*)
- **v_d** Displacement Velocity (*Meter per Second*)
- **v_s** Settling Velocity of Particles (*Meter per Second*)
- **v'** Falling Speed (*Meter per Second*)
- **μ**viscosity Dynamic Viscosity (*Poise*)
- **v** Kinematic Viscosity (*Stokes*)
- **ρ_f** Mass Density of Fluid (*Kilogram per Cubic Meter*)
- **ρ_m** Mass Density of Particles (*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), Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Temperature** in Celsius ($^{\circ}\text{C}$), Fahrenheit ($^{\circ}\text{F}$)
Temperature Unit Conversion 
- **Measurement:** **Area** in Square Millimeter (mm^2)
Area Unit Conversion 
- **Measurement:** **Speed** in Meter per Second (m/s)
Speed Unit Conversion 
- **Measurement:** **Force** in Newton (N)
Force Unit Conversion 
- **Measurement:** **Dynamic Viscosity** in Poise (P)
Dynamic Viscosity 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 



Check other formula lists

- [Diameter of Sediment Particle Formulas](#) 
- [Displacement and Drag Formulas](#) 
- [Sedimentation Tank Formulas](#) 
- [Settling Velocity Formulas](#) 
- [Settling Zone Formulas](#) 
- [Specific Gravity and Density Formulas](#) 

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