



Theory of Type 1 Settling Formulas

Calculators!

Examples!

Conversions!

Bookmark calculatoratoz.com, unitsconverters.com

Widest Coverage of Calculators and Growing - 30,000+ Calculators!

Calculate With a Different Unit for Each Variable - In built Unit Conversion!

Widest Collection of Measurements and Units - 250+ Measurements!

Feel free to SHARE this document with your friends!

Please leave your feedback here...





List of 45 Theory of Type 1 Settling Formulas

Theory of Type 1 Settling 2

Coefficient of Drag

1) Coefficient of Drag for Transition Settling

$$\left| \mathrm{C_D} = \left(rac{24}{\mathrm{R_e}}
ight) + \left(rac{3}{\left(\mathrm{R_e}
ight)^{0.5}}
ight) + 0.34
ight|$$

Open Calculator 🗗

2) Coefficient of Drag for Transition Settling given Reynold Number

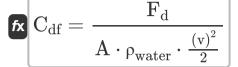
$$\left| \mathrm{C}_{\mathrm{dt}} = \left(rac{18.5}{\left(\mathrm{R_e}
ight)^{0.6}}
ight)
ight|$$

Open Calculator

$$oxed{ex} 0.111632 = \left(rac{18.5}{(5000)^{0.6}}
ight)$$



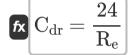
3) Coefficient of Drag given Drag Force Offered by Fluid 🗗



Open Calculator 🗗

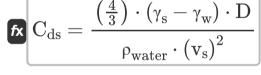
ex
$$0.38 = \frac{76.95 \mathrm{N}}{50 \mathrm{m}^2 \cdot 1000 \mathrm{kg/m}^3 \cdot \frac{(0.09 \mathrm{m/s})^2}{2}}$$

4) Coefficient of Drag given Reynold Number



Open Calculator

5) Coefficient of Drag given Settling Velocity of Spherical Particle



$$\boxed{ 1.125926 = \frac{\left(\frac{4}{3}\right) \cdot \left(10 \text{kN/m}^3 - 9810 \text{N/m}^3\right) \cdot 10.0 \text{m} }{1000 \text{kg/m}^3 \cdot \left(1.5 \text{m/s}\right)^2 } }$$



Density of Water 2

6) Density of Water given Kinematic Viscosity of Water

$$ho_{
m water} = \left(rac{\mu_{
m viscosity}}{
u}
ight)$$

Open Calculator 🗗

$$= 1000 \mathrm{kg/m^3} = \left(\frac{10.2 \mathrm{P}}{10.20 \mathrm{St}}\right)$$

Diameter of Particle

7) Diameter of Particle given Reynold Number

$$D_{
m p} = rac{{
m R}_{
m p} \cdot {
m v}}{{
m v}_{
m s}}$$

Open Calculator 🗗

$$oxed{ex} 0.0136 \mathrm{m} = rac{20 \cdot 10.20 \mathrm{St}}{1.5 \mathrm{m/s}}$$



8) Diameter of Particle given Settling Velocity for Modified Hazen's Equation

 $\mathbf{f}_{\mathbf{z}}$ $D_{\mathrm{p}}=\left(rac{V_{\mathrm{sm}}}{60.6\cdot(\mathrm{G}-1)\cdot\left(rac{(3\cdot\mathrm{T})+70}{100}
ight)}
ight)$

Open Calculator 🗗

ex $0.009986 \mathrm{m} = \left(rac{0.0118 \mathrm{m/s}}{60.6 \cdot (1.006 - 1) \cdot \left(rac{(3 \cdot 85 \mathrm{K}) + 70}{100}
ight)}
ight)$

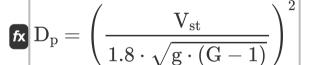
9) Diameter of Particle given Settling Velocity for Organic Matter

 $\mathbf{E} \left[\mathrm{D_p} = \left(rac{\mathrm{v_{s(o)}}}{0.12 \cdot ((3 \cdot \mathrm{T}) + 70)}
ight)
ight]$

Open Calculator 🗗

 $oxed{ex} 0.01 \mathrm{m} = \left(rac{0.39 \mathrm{m/s}}{0.12 \cdot ((3 \cdot 85 \mathrm{K}) + 70)}
ight)$

10) Diameter of Particle given Settling Velocity for Turbulent Settling



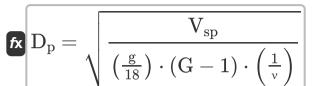
Open Calculator

ex $0.009978 \mathrm{m} = \left(\frac{0.0436 \mathrm{m/s}}{1.8 \cdot \sqrt{9.8 \mathrm{m/s^2} \cdot (1.006 - 1)}} \right)^2$





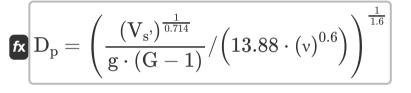
11) Diameter of Particle given Settling Velocity of Spherical Particle



Open Calculator 🗗

ex
$$0.009996 \mathrm{m} = \sqrt{rac{0.00032 \mathrm{m/s}}{\left(rac{9.8 \mathrm{m/s^2}}{18}
ight) \cdot (1.006 - 1) \cdot \left(rac{1}{10.20 \mathrm{St}}
ight)}}$$

12) Diameter of Particle given Settling Velocity within Transition Zone

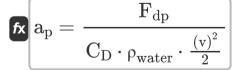


Open Calculator

$$= \left(\frac{(0.0005 \text{m/s})^{\frac{1}{0.714}}}{9.8 \text{m/s}^2 \cdot (1.006 - 1)} / \left(13.88 \cdot (10.20 \text{St})^{0.6}\right)\right)^{\frac{1}{1.6}}$$

Drag Force

13) Area of Particle given Drag Force Offered by Fluid



Open Calculator 🗗

$$oxed{ex} 0.493827 \mathrm{m}^{2} = rac{0.760 \mathrm{N}}{0.38 \cdot 1000 \mathrm{kg/m}^{3} \cdot rac{(0.09 \mathrm{m/s})^{2}}{2}}$$





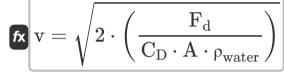
14) Drag Force Offered by Fluid 🚰

 $\mathbf{F}_{\mathrm{d}} = \left(\mathrm{C}_{\mathrm{D}} \cdot \mathrm{A} \cdot \mathrm{
ho_{\mathrm{water}}} \cdot rac{\left(\mathrm{v}
ight)^2}{2}
ight)$

Open Calculator 🖸

 $extbf{ex} egin{aligned} 76.95 \mathrm{N} = \left(0.38 \cdot 50 \mathrm{m}^2 \cdot 1000 \mathrm{kg/m}^3 \cdot rac{\left(0.09 \mathrm{m/s}
ight)^2}{2}
ight) \end{aligned}$

15) Velocity of Fall given Drag Force Offered by Fluid

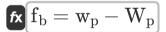


Open Calculator 🖸

 $m ex = \sqrt{2 \cdot \left(rac{76.95 N}{0.38 \cdot 50 m^2 \cdot 1000 kg/m^3}
ight)}$

Effective Weight of Particle

16) Buoyancy given Effective Weight of Particle



= 1.999991 N = 2.00009 N - 0.099 g



17) Effective Weight of Particle

Open Calculator 2

 $\left|\mathbf{W}_{
m p}=\left(\left(rac{4}{3}
ight)\cdot\pi\cdot({
m r_p})^3
ight)\cdot({
m \gamma_s}-{
m \gamma_w})
ight|$

 $= 2 \left(\left(\frac{4}{3} \right) \cdot \pi \cdot (0.005 \text{m})^3 \right) \cdot (10 \text{kN/m}^3 - 9810 \text{N/m}^3)$

18) Effective Weight of Particle given Buoyancy

fx $W_{
m p}=w_{
m p}-f_{
m b}$

Open Calculator

[0.09g = 2.00009N - 2.0N]

19) Radius of Particle given Effective Weight of Particle

 $\left|\mathbf{r}_{\mathrm{p}}
ight|=\left(rac{W_{\mathrm{p}}}{\left(rac{4}{2}
ight)\cdot\pi}\cdot\left(\gamma_{\mathrm{s}}-\gamma_{\mathrm{w}}
ight)
ight)^{rac{1}{3}}$

Open Calculator

 $\left[0.164981 \mathrm{m} = \left(rac{0.099 \mathrm{g}}{\left(rac{4}{5}
ight) \cdot \pi} \cdot (10 \mathrm{kN/m^3} - 9810 \mathrm{N/m^3})
ight)^{rac{1}{3}}$

20) Total Weight given Effective Weight of Particle 🗹

fx $w_{
m p}=W_{
m p}+f_{
m b}$

Open Calculator

2.000099N = 0.099g + 2.0N



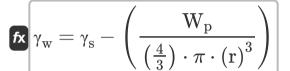


21) Unit weight of Particle given Effective Weight of Particle

 $\left| \mathbf{\gamma}_{
m s} = \left(rac{
m W_p}{\left(rac{4}{3}
ight) \cdot \pi \cdot \left(
m r
ight)^3}
ight) + \gamma_{
m w}
ight|$

Open Calculator 🗗

22) Unit Weight of Water given Effective Weight of Particle



Open Calculator 🗗

 $\boxed{ 10000 \mathrm{N/m^3} = 10 \mathrm{kN/m^3} - \left(\frac{0.099 \mathrm{g}}{\left(\frac{4}{3}\right) \cdot \pi \cdot \left(2.00 \mathrm{m}\right)^3} \right) }$

Kinematic Viscosity 2

23) Dynamic Viscosity given Kinematic Viscosity of Water

fx $\mu_{
m viscosity} =
u \cdot
ho_{
m water}$

Open Calculator

 $ext{ex} 10.2 ext{P} = 10.20 ext{St} \cdot 1000 ext{kg/m}^{ ext{3}}$



24) Kinematic Viscosity of Water given Dynamic Viscosity



Open Calculator 2

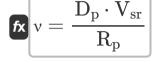
Open Calculator

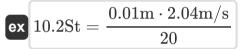
$$u = rac{\mu_{
m viscosity}}{
ho_{
m water}}$$

$$ext{ex} 10.2 ext{St} = rac{10.2 ext{P}}{1000 ext{kg/m}^3}$$

25) Kinematic Viscosity of Water given Reynold Number 🛂

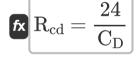






Reynold Number

26) Reynold Number given Coefficient of Drag





27) Reynold Number given Coefficient of Drag for Transition Settling

 $\left| \mathbf{R}_{\mathrm{t}} = \left(rac{18.5}{\mathrm{C_D}}
ight)^{rac{1}{0.6}}
ight|$

Open Calculator

28) Reynold Number given Settling Velocity of Spherical Particle 🛂

fx $R_{
m s}=rac{{
m v}_{
m s}\cdot{
m D}}{r}$

Open Calculator

Settling Velocity of Particle

29) Settling Velocity for Inorganic Solids 🛂

 $\mathrm{v_{s(in)}} = \left(\mathrm{D_p} \cdot \left((3 \cdot \mathrm{T}) + 70 \right) \right)$

Open Calculator G

 $= 3.25 ext{m/s} = (0.01 ext{m} \cdot ((3 \cdot 85 ext{K}) + 70))$



30) Settling Velocity for Modified Hazen's Equation G

Open Calculator

fx

$$\mathbf{V}_{\mathrm{sm}} = \left(60.6 \cdot \mathrm{D_p} \cdot (\mathrm{G} - 1) \cdot \left(\frac{(3 \cdot \mathrm{T}) + 70}{100}\right)\right)$$

 $\boxed{ 0.011817 \text{m/s} = \left(60.6 \cdot 0.01 \text{m} \cdot (1.006 - 1) \cdot \left(\frac{(3 \cdot 85 \text{K}) + 70}{100} \right) \right) }$

31) Settling Velocity for Organic Matter

 $v_{s(o)} = 0.12 \cdot D_p \cdot ((3 \cdot T) + 70)$

Open Calculator 2

 $0.39 \text{m/s} = 0.12 \cdot 0.01 \text{m} \cdot ((3 \cdot 85 \text{K}) + 70)$

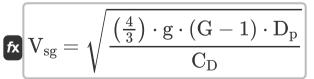
32) Settling Velocity for Turbulent Settling

 $V_{
m st} = \left(1.8 \cdot \sqrt{{
m g} \cdot ({
m G} - 1) \cdot {
m D}_{
m p}}
ight)$

Open Calculator G

ex $0.043648 \mathrm{m/s} = \left(1.8 \cdot \sqrt{9.8 \mathrm{m/s^2} \cdot (1.006 - 1) \cdot 0.01 \mathrm{m}}\right)$

33) Settling Velocity given Specific Gravity of Particle 🗹



Open Calculator

 $ext{ex} | 0.045422 ext{m/s} = \sqrt{rac{\left(rac{4}{3}
ight) \cdot 9.8 ext{m/s}^2 \cdot (1.006 - 1) \cdot 0.01 ext{m}}{0.38}}$

© calculatoratoz.com. A softusvista inc. venture!

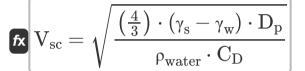


34) Settling Velocity of Spherical Particle 🖸

 $V_{\mathrm{sp}} = \left(rac{\mathrm{g}}{18}
ight) \cdot \left(\mathrm{G} - 1
ight) \cdot \left(rac{\left(\mathrm{D_p}
ight)^2}{\mathrm{v}}
ight)^{-1}$

Open Calculator 🗗

35) Settling Velocity of Spherical Particle given Coefficient of Drag



Open Calculator 🗗

ex
$$0.08165 \mathrm{m/s} = \sqrt{\frac{\left(\frac{4}{3}\right) \cdot \left(10 \mathrm{kN/m^3} - 9810 \mathrm{N/m^3}\right) \cdot 0.01 \mathrm{m}}{1000 \mathrm{kg/m^3} \cdot 0.38}}$$

36) Settling Velocity of Spherical Particle given Reynold Number

$$V_{
m sr} = rac{R_{
m p} \cdot
u}{D_{
m p}}$$

$$\mathbf{ex} = \frac{20 \cdot 10.20 \mathrm{St}}{0.01 \mathrm{m}}$$



37) Settling Velocity with respect to Diameter of Particle

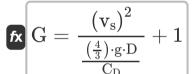
 $\left| \mathbf{V}_{\mathrm{sd}}
ight| = \left(rac{\mathrm{g} \cdot \left(\mathrm{G} - 1
ight) \cdot \left(\mathrm{D_p}
ight)^{1.6}}{13.88 \cdot \left(\mathrm{v}
ight)^{0.6}}
ight)^{0.714}$

Open Calculator 🗗

$$= \left(\frac{9.8 \text{m/s}^2 \cdot (1.006 - 1) \cdot (0.01 \text{m})^{1.6}}{13.88 \cdot (10.20 \text{St})^{0.6}}\right)^{0.714}$$

Specific Gravity of Particle

38) Specific Gravity of Particle given Settling Velocity



Open Calculator 🗗

ex
$$1.006543 = \frac{\left(1.5 \mathrm{m/s}\right)^2}{\frac{\left(\frac{4}{3}\right) \cdot 9.8 \mathrm{m/s^2 \cdot 10.0 m}}{0.38}} + 1$$



39) Specific Gravity of Particle given Settling Velocity for Modified Hazen's Equation

 $\left| \mathbf{G} \right| \mathbf{G} = \left(rac{\mathbf{v}_{\mathrm{s}}}{60.6 \cdot \mathbf{D} \cdot \left(rac{(3 \cdot \mathrm{T}) + 70}{100}
ight)}
ight) + 1$

Open Calculator 2

$$oxed{ex} 1.000762 = \left(rac{1.5 ext{m/s}}{60.6 \cdot 10.0 ext{m} \cdot \left(rac{(3 \cdot 85 ext{K}) + 70}{100}
ight)}
ight) + 1$$

40) Specific Gravity of Particle given Settling Velocity of Spherical Particle

$$\mathbf{G} = \left(rac{v_{
m s}}{\left(rac{
m g}{18}
ight) \cdot \left(rac{
m (D)^2}{
m v}
ight)}
ight) + 1$$

Open Calculator

ex
$$1.000028 = \left(rac{1.5 ext{m/s}}{\left(rac{9.8 ext{m/s}^2}{18}
ight) \cdot \left(rac{(10.0 ext{m})^2}{10.208 ext{t}}
ight)}
ight) + 1$$



41) Specific Gravity of Particle given Settling Velocity within Transition Zone

 $\mathbf{G} = \left(rac{\left(\mathrm{v_s}
ight)^{rac{1}{0.714}}}{\mathrm{g}\cdot\left(\mathrm{D}
ight)^{1.6}}/{\left(13.88\cdot\left(\mathrm{v}
ight)^{0.6}
ight)}
ight) + 1$

Open Calculator 🗗

 $oxed{ex} 1.020317 = \left(rac{(1.5 ext{m/s})^{rac{1}{0.714}}}{9.8 ext{m/s}^2 \cdot (10.0 ext{m})^{1.6}} / \Big(13.88 \cdot (10.20 ext{St})^{0.6}\Big)
ight) + 1$

42) Specific Gravity of Particle when Settling Velocity for Turbulent Settling is Considered

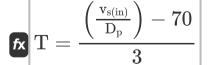
 $\mathbf{f}_{\mathbf{x}} \mathbf{G}_{\mathrm{p}} = \left(rac{\mathbf{v}_{\mathrm{s}}}{1.8 \cdot \sqrt{\mathbf{g} \cdot (\mathbf{G} - 1) \cdot \mathbf{D}}}
ight)^2 + 1$

Open Calculator 🗗

ex $2.181028 = \left(\frac{1.5 \mathrm{m/s}}{1.8 \cdot \sqrt{9.8 \mathrm{m/s^2} \cdot (1.006 - 1) \cdot 10.0 \mathrm{m}}}\right)^2 + 1$

Temperature

43) Temperature given Settling Velocity for Inorganic Solids



Open Calculator

 $ext{ex} 85 ext{K} = rac{\left(rac{3.25 ext{m/s}}{0.01 ext{m}}
ight) - 70}{3}$



© calculatoratoz.com. A softusvista inc. venture!



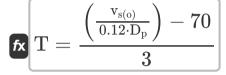
44) Temperature given Settling Velocity for Modified Hazen's Equation



$$ag{T} = rac{\left(\left(rac{ ext{V}_{ ext{sm}}}{60.6 \cdot ext{D}_{ ext{p}} \cdot (ext{G}-1)}
ight) \cdot 100
ight) - 70}{3}$$

Open Calculator 🗗

45) Temperature given Settling Velocity for Organic Matter



$$= 85 \mathrm{K} = rac{\left(rac{0.39 \mathrm{m/s}}{0.12 \cdot 0.01 \mathrm{m}}
ight) - 70}{3}$$



Variables Used

- A Area (Square Meter)
- a_p Area of Particle (Square Meter)
- Cn Coefficient of Drag
- C_{df} Coefficient of Drag given Drag Force
- C_{dr} Coefficient of Drag given Reynold Number
- C_{ds} Coefficient of Drag given Settling Velocity
- C_{dt} Coefficient of Drag for Transition Settling
- **D** Diameter (Meter)
- D_p Diameter of Particle (Meter)
- **f**_b Force due to Buoyancy (Newton)
- F_d Drag Force (Newton)
- F_{dp} Particle Drag Force (Newton)
- g Acceleration due to Gravity (Meter per Square Second)
- G Specific Gravity of Sediment
- G_p Specific Gravity of Particle
- **r** Radius (Meter)
- R_{cd} Reynold Number given Coefficient of Drag
- Re Reynolds Number
- r_p Radius of Particle (Meter)
- R_p Reynolds Number of Particle
- R_s Reynold Number for Spherical Particle





- R_t Reynold Number for Transition Settling
- **T** Temperature (Kelvin)
- V Velocity of Fall (Meter per Second)
- V_S Settling Velocity (Meter per Second)
- V_{S'} Settling Velocity in Transition Zone (Meter per Second)
- V_{s(in)} Settling Velocity for Inorganic Solids (Meter per Second)
- V_{S(0)} Settling Velocity of Organic Solids (Meter per Second)
- V_{sc} Settling Velocity of Particle given Coeff of Drag (Meter per Second)
- V_{sd} Settling Velocity given Diameter of Particle (Meter per Second)
- V_{sq} Settling Velocity given Specific Gravity (Meter per Second)
- V_{sm} Settling Velocity for Modified Hazen's Equation (Meter per Second)
- V_{sp} Settling Velocity of Spherical Particle (Meter per Second)
- **V**_{Sr} Settling Velocity of Particle given Reynold Number (*Meter per Second*)
- V_{st} Settling Velocity for Turbulent Settling (Meter per Second)
- W_D Total Weight of Particle (Newton)
- W_p Effective Weight of Particle (Gram)
- γ_s Unit Weight of Particle (Kilonewton per Cubic Meter)
- γ_w Unit Weight of Water (Newton per Cubic Meter)
- μ_{viscosity} Dynamic Viscosity (Poise)
- V Kinematic Viscosity (Stokes)
- ρ_{water} Water Density (Kilogram per Cubic Meter)





Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- 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 Gram (g)
 Weight Unit Conversion
- Measurement: Temperature in Kelvin (K)
 Temperature Unit Conversion
- Measurement: Area in Square Meter (m²)
 Area 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: Dynamic Viscosity in Poise (P)

 Dynamic Viscosity Unit Conversion
- Measurement: Kinematic Viscosity in Stokes (St)

 Kinematic Viscosity Unit Conversion
- Measurement: Density in Kilogram per Cubic Meter (kg/m³)
 Density Unit Conversion





 Measurement: Specific Weight in Kilonewton per Cubic Meter (kN/m³), Newton per Cubic Meter (N/m³)
 Specific Weight Unit Conversion





Check other formula lists

- of Sedimentation Tank Formulas (
- · Efficiency of High Rate Filters Formulas [7]
- Design of Continuous Flow Type Food to Microorganism Ratio or F to M Ratio Formulas
 - Sludge Recycle and Rate of Returned Sludge Formulas
 - Theory of Type 1 Settling Formulas

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

8/27/2024 | 6:30:33 AM UTC

Please leave your feedback here...



