



# Design of Rapid Mix Basin and Flocculation Basin Formulas

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## List of 19 Design of Rapid Mix Basin and Flocculation Basin Formulas

## Design of Rapid Mix Basin and Flocculation Basin

1) Dynamic Viscosity given Mean Velocity Gradient

 $\mu_{
m viscosity} = \left(rac{
m P}{\left(
m G
ight)^2 \cdot 
m V}
ight)^{-1}$ 

Open Calculator

$$oxed{ex} 833.3333 ext{P} = \left( rac{3 ext{kJ/s}}{\left( 2 ext{s}^{-1} 
ight)^2 \cdot 9 ext{m}^3} 
ight)$$

2) Dynamic Viscosity given Power Requirement for Flocculation

$$\mu_{
m viscosity} = \left(rac{
m P}{\left(
m G
ight)^2 \cdot 
m V}
ight)$$

Open Calculator 🗗

$$ext{ex} \left[ 833.3333 ext{P} = \left( rac{3 ext{kJ/s}}{\left( 2 ext{s}^{ ext{-}1} 
ight)^2 \cdot 9 ext{m}^3} 
ight) 
ight]$$



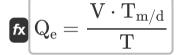
### 3) Dynamic Viscosity given Power Requirement for Rapid Mixing Operations

 $\mu_{
m viscosity} = \left(rac{
m P}{\left(
m G
ight)^2 \cdot 
m V}
ight)$ 

Open Calculator

 $ext{ex} 833.3333 ext{P} = \left(rac{3 ext{kJ/s}}{(2 ext{s}^{-1})^2 \cdot 9 ext{m}^3}
ight)$ 

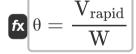
4) Flow Rate of Secondary Effluent given Volume of Flocculation Basin



Open Calculator

 $ext{ex} 0.54 ext{m}^3/ ext{s} = rac{9 ext{m}^3 \cdot 0.30}{5 ext{s}}$ 

5) Hydraulic Retention Time given Volume of Rapid Mix Basin

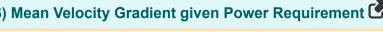


Open Calculator 🗗

 $7 = \frac{196 m^3}{28 m^3/s}$ 



#### 6) Mean Velocity Gradient given Power Requirement

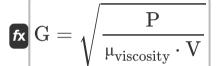


Open Calculator

$$\mathbf{G} = \sqrt{rac{P}{\mu_{viscosity} \cdot V}}$$

ex 
$$2.000004 s^{-1} = \sqrt{\frac{3 k J/s}{833.33 P \cdot 9 m^3}}$$

#### 7) Mean Velocity Gradient given Power Requirement for Flocculation



Open Calculator 2

$$ext{ex} \ 2.000004 ext{s}^{ ext{-1}} = \sqrt{rac{3 ext{kJ/s}}{833.33 ext{P} \cdot 9 ext{m}^3}}$$

#### 8) Mean Velocity Gradient given Power Requirement for Rapid Mixing Operations

$$\mathbf{G} = \sqrt{rac{P}{\mu_{viscosity} \cdot V}}$$

Open Calculator 2

$$ext{ex} \ 2.000004 ext{s}^{ ext{-1}} = \sqrt{rac{3 ext{kJ/s}}{833.33 ext{P} \cdot 9 ext{m}^3}}$$



#### 9) Power Requirement for Flocculation in Direct Filtration Process

 $\left. \mathbf{F} \mathbf{F} \right| \mathbf{P} = \left( \mathbf{G} 
ight)^2 \cdot \mu_{\mathrm{viscosity}} \cdot \mathbf{V} \right|$ 

Open Calculator 🚰

 $\texttt{ex} [2.999988 \text{kJ/s} = (2 \text{s}^{\text{-}\text{1}})^2 \cdot 833.33 \text{P} \cdot 9 \text{m}^{\text{3}}$ 

## 10) Power Requirement for Rapid Mixing Operations in Wastewater Treatment

 $P = (G)^2 \cdot \mu_{viscosity} \cdot V$ 

Open Calculator

 $ext{ex} \left[ 2.999988 ext{kJ/s} = \left( 2 ext{s}^{ ext{-}1} 
ight)^2 \cdot 833.33 ext{P} \cdot 9 ext{m}^3 
ight]$ 

#### 11) Power Requirement given Mean Velocity Gradient

 $\mathbf{E} \left[ \mathrm{P} = \left( \mathrm{G} 
ight)^2 \cdot \mu_{\mathrm{viscosity}} \cdot \mathrm{V} 
ight]$ 

Open Calculator 🖸

 $ext{ex} \ 2.999988 ext{kJ/s} = \left(2 ext{s}^{-1}
ight)^2 \cdot 833.33 ext{P} \cdot 9 ext{m}^3$ 

#### 12) Required Volume of Flocculation Basin

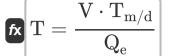
 $V = rac{T \cdot Q_e}{T_{m/d}}$ 

Open Calculator

 $9 ext{m}^3 = rac{5 ext{s} \cdot 0.54 ext{m}^3/ ext{s}}{0.30}$ 



#### 13) Retention Time given Volume of Flocculation Basin



Open Calculator 🗗

#### 14) Time in Minutes Per Day given Volume of Flocculation Basin

 $ag{T_{m/d}} = rac{T \cdot Q_e}{V}$ 

Open Calculator 🗗

$$=$$
  $0.3 = rac{5 ext{s} \cdot 0.54 ext{m}^3/ ext{s}}{9 ext{m}^3}$ 

### 15) Volume of Flocculation Basin given Power Requirement for Flocculation

 $V = \left(rac{P}{\left(G
ight)^2 \cdot \mu_{
m viscosity}}
ight)$ 

Open Calculator

$$oxed{ex} 9.000036 \mathrm{m}^{_3} = \left(rac{3 \mathrm{kJ/s}}{\left(2 \mathrm{s}^{_{-1}}
ight)^2 \cdot 833.33 \mathrm{P}}
ight)$$



#### 16) Volume of Mixing Tank given Mean Velocity Gradient 🗗

 $V = \left( rac{P}{\left( G 
ight)^2 \cdot \mu_{viscosity}} 
ight)$ 

Open Calculator 2

 $9.000036 \text{m}^3 = \left(\frac{3 \text{kJ/s}}{(2 \text{s}^{-1})^2, 833, 33 \text{P}}\right)$ 

#### 17) Volume of Mixing Tank given Power Requirement for Rapid Mixing Operations

 $V = \left(\frac{P}{(G)^2 \cdot \mu_{\text{viscosity}}}\right)$ 

Open Calculator 🖸

 $\mathbf{ex} \ 9.000036 \mathrm{m}^{\scriptscriptstyle 3} = \left( rac{3 \mathrm{kJ/s}}{\left(2 \mathrm{s}^{-1}\right)^2 \cdot 833.33 \mathrm{P}} 
ight)$ 

#### 18) Volume of Rapid Mix Basin

fx  $V_{
m rapid} = heta \cdot W$ 

Open Calculator 2

extstyle ext



#### 19) Wastewater Flow given Volume of Rapid Mix Basin 🗲





Open Calculator

 $\boxed{\text{ex}} \ 28 \text{m}^{\scriptscriptstyle 3}/\text{s} = \frac{196 \text{m}^{\scriptscriptstyle 3}}{}$ 



#### Variables Used

- G Mean Velocity Gradient (1 Per Second)
- P Power Requirement (Kilojoule per Second)
- Q Flow Rate of Secondary Effluent (Cubic Meter per Second)
- T Retention Time (Second)
- T<sub>m/d</sub> Time in Min Per Day
- V Volume of Tank (Cubic Meter)
- V<sub>rapid</sub> Volume of Rapid Mix Basin (Cubic Meter)
- W Waste Water Flow (Cubic Meter per Second)
- **θ** Hydraulic Retention Time in Seconds (Second)
- **θ** Hydraulic Retention Time (Second)
- µviscosity Dynamic Viscosity (Poise)





#### Constants, Functions, Measurements used

- 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: Time in Second (s)

  Time Unit Conversion
- Measurement: Volume in Cubic Meter (m³)

  Volume Unit Conversion
- Measurement: Power in Kilojoule per Second (kJ/s)
   Power Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/s)
   Volumetric Flow Rate Unit Conversion
- Measurement: Dynamic Viscosity in Poise (P)
   Dynamic Viscosity Unit Conversion
- Measurement: First Order Reaction Rate Constant in 1 Per Second (s<sup>-1</sup>)

  First Order Reaction Rate Constant Unit Conversion





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