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# Water Hammer Formulas

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# List of 10 Water Hammer Formulas

## Water Hammer

### 1) Bulk Modulus of Elasticity of Water given Ratio of Velocities

$$fx \quad K_w = \frac{P_w}{V_R}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b\_img.jpg\)](#)

$$ex \quad 191.6933MPa = \frac{1.8MPa}{0.00939}$$

### 2) Bulk Modulus of Elasticity of Water given Velocity of Sound in Water

$$fx \quad K_w = \frac{1434 \cdot P_w}{V_w}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d\_img.jpg\)](#)

$$ex \quad 191.6258MPa = \frac{1434 \cdot 1.8MPa}{13.47m/s}$$

### 3) Bulk Modulus of Elasticity of Water given Water Hammer Pressure

$$fx \quad K_w = \frac{C \cdot P_w}{V_w}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d\_img.jpg\)](#)

$$ex \quad 197.7728MPa = \frac{1480m/s \cdot 1.8MPa}{13.47m/s}$$



#### 4) Initial Velocity of Water given Velocity of Sound in Water

$$fx \quad V_w = \frac{P_w \cdot 1434}{K_w}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235\_img.jpg\)](#)

$$ex \quad 13.46549m/s = \frac{1.8MPa \cdot 1434}{191.69MPa}$$

#### 5) Initial Velocity of Water given Water Hammer Pressure

$$fx \quad V_w = \frac{P_w \cdot C}{K_w}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0\_img.jpg\)](#)

$$ex \quad 13.89744m/s = \frac{1.8MPa \cdot 1480m/s}{191.69MPa}$$

#### 6) Ratio of Velocity of Water to Velocity of Sound in Water

$$fx \quad V_R = \frac{P_w}{K_w}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

$$ex \quad 0.00939 = \frac{1.8MPa}{191.69MPa}$$

#### 7) Velocity of Sound in Water given Water Hammer Pressure

$$fx \quad C = \frac{V_w \cdot K_w}{P_w}$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754\_img.jpg\)](#)

$$ex \quad 1434.48m/s = \frac{13.47m/s \cdot 191.69MPa}{1.8MPa}$$




8) Water Hammer Pressure 

$$fx \quad P_w = \frac{V_w \cdot K_w}{C}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95\_img.jpg\)](#)


$$ex \quad 1.744638MPa = \frac{13.47m/s \cdot 191.69MPa}{1480m/s}$$

9) Water Hammer Pressure given Ratio of Velocity of Water to Velocity of Sound in Water 

$$fx \quad P_w = (V_R \cdot K_w)$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2\_img.jpg\)](#)

$$ex \quad 1.799969MPa = (0.00939 \cdot 191.69MPa)$$

10) Water Hammer Pressure given Velocity of Sound in Water 

$$fx \quad P_w = \frac{V_w \cdot K_w}{1434}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7\_img.jpg\)](#)

$$ex \quad 1.800603MPa = \frac{13.47m/s \cdot 191.69MPa}{1434}$$





## Variables Used

- **C** Velocity of Sound in Water (*Meter per Second*)
- **K<sub>w</sub>** Bulk Modulus of Water (*Megapascal*)
- **P<sub>w</sub>** Water Hammer Pressure in Environmental Eng. (*Megapascal*)
- **V<sub>R</sub>** Ratio of Velocities
- **V<sub>w</sub>** Flow Velocity of Fluid (*Meter per Second*)



## Constants, Functions, Measurements used

- **Measurement: Pressure** in Megapascal (MPa)  
*Pressure Unit Conversion* 
- **Measurement: Speed** in Meter per Second (m/s)  
*Speed Unit Conversion* 



## Check other formula lists

- [Internal Water Pressure Formulas](#) 
- [Stresses at Bends Formulas](#) 
- [Stresses Due to External Loads Formulas](#) 
- [Temperature Stresses Formulas](#) 
- [Water Hammer Formulas](#) 

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