

**CWEA**  
**Electrical / Instrumentation**  
**Math Formulas and Conversion Factors**

1 cubic foot = 1,728 cubic inches  
 1 day = 1,440 minutes  
 1 horsepower = 33,000 foot-pounds/minute  
 1 horsepower = 42.45 Btu/minute  
 Coefficients of thermal expansion =  
     0.00000633/F° for steel  
     0.00001/F° for brass  
 1 psi = 2.31 feet of water  
 1 MGD = 1.55 cubic feet/second  
 1 therm = 100,000 Btu

1 cubic foot of water weighs 62.43 pounds  
 1 cubic foot/second = 449 gallons/minute  
 1 kilowatt = 1000 watts  
 1 Btu = 778 foot-pounds  
 1 cubic foot = 7.48 gallons  
 1 gallon of water weighs 8.34 pounds  
 1 MGD = 694 gallons/minute  
 1 horsepower = 746 watts  
 1 watt = 3.412 Btu/hour

$$\pi = 3.14159$$

$$Circumference_{circle} = \pi \times diameter$$

$$Area_{triangle} = \frac{base \times height}{2}$$

$$Area_{circle} = \frac{\pi}{4} \times diameter^2$$

$$Perimeter_{rectangle} = 2 \times (length + width)$$

$$Area_{rectangle} = base \times height$$

$$Area_{circle} = \pi \times radius^2$$

$$Area_{circle} = 0.7854 \times diameter^2$$

$$Volume_{rectangular\ solid} = length \times width \times height \quad Volume_{cylinder} = \frac{\pi}{4} \times diameter^2 \times height$$

$$Volume_{triangular\ solid} = \frac{base \times height \times length}{2} \quad Volume_{cylinder} = \pi \times radius^2 \times height$$

$$Water\ horsepower = \frac{flow \times total\ head \times specific\ gravity}{3960}$$

$$Brake\ horsepower = \frac{water\ horsepower}{efficiency}$$

$$Hydrostatic\ force = column\ area \times column\ height \times fluid\ density$$

$$Thermal\ expansion = coeff.\ of\ thermal\ expansion \times length \times \Delta T$$

$$Energy = power \times time$$

$$Efficiency = \frac{work\ output}{work\ input}$$

$$3\ phase\ amperes = \frac{746 \times horsepower}{1.732 \times volts \times efficiency \times power\ factor}$$

$$3\ phase\ volt\ amperes = volts \times amperes \times 1.732$$