

## WATER OPERATOR CLASS C AND D CONVERSIONS AND EQUATIONS

1 ft = 12 in	1 ft <sup>2</sup> = 144 in <sup>2</sup>	1 ft <sup>3</sup> = 1728 in <sup>3</sup>	1 ft <sup>3</sup> = 7.48 gal	1 lb = 454 g
1 yd = 3 ft	1 yd <sup>2</sup> = 9ft <sup>2</sup>	1 yd <sup>3</sup> = 27 ft <sup>3</sup>	1 gal = 231 in <sup>3</sup>	1ft <sup>3</sup> /sec= 450 gal/min
1 m = 3.28 ft	1 m <sup>2</sup> = 10.8 ft <sup>2</sup>	1 m <sup>3</sup> = 35.3 ft <sup>3</sup>	1 gal = 3.79 liter	1 gal/sec = 0.133 ft <sup>3</sup> /s
1 mile = 5280 ft	1 mile <sup>2</sup> = 640 acres	1 acre-ft = 43,560 ft <sup>3</sup>	1 liter = 0.264 gal	1gal/sec= 7.98 ft <sup>3</sup> /min
1 psi = 2.31 ft H <sub>2</sub> O	°C = 5/9(°F-32)	1 gr/gal = 17.1 ppm	1 ft <sup>3</sup> = 62.4 lb H <sub>2</sub> O	
1 ft H <sub>2</sub> O = 0.434 psi	°F = (9/5 x °C)+32	1 ppm = 1 mg/L	1gal = 8.34 lb H <sub>2</sub> O	

**V = L ÷ T**  
 V = velocity  
 L = length  
 T = Time

**Q = A x V**  
 Q = flow rate (ft<sup>3</sup>/sec)  
 A = cross-sectional area (ft<sup>2</sup>)  
 V = velocity (ft/sec)

**Detention Time =**  
 $\frac{\text{Volume of tank}}{\text{Flow rate to or from tank}}$   
 T = detention time (sec)  
 V = volume (ft<sup>3</sup>)  
 Q = flow rate (ft<sup>3</sup>/sec)

**Flow Rate:**  
 gal/hr (GPH) = GPM x 60 min/hr  
 gal/day (GPD) = GPM x 1440 min/day  
 MGD =  $\frac{\text{gal/day}}{1,000,000}$

**Filtration =**  
 Filter Loading =  $\frac{\text{GPM}}{\text{Area sq ft}}$   
 Backwash rate =  $\frac{\text{GPM}}{\text{Area sq ft}}$   
 Inches of Rise =  $\frac{\text{GPM}}{\text{gal/inch}}$

**Ion-exchange softening:**  
 $\text{gal treated} = \frac{\text{volume(ft}^3\text{)} \times \text{gr/ft}^3}{\text{gr/gal}}$

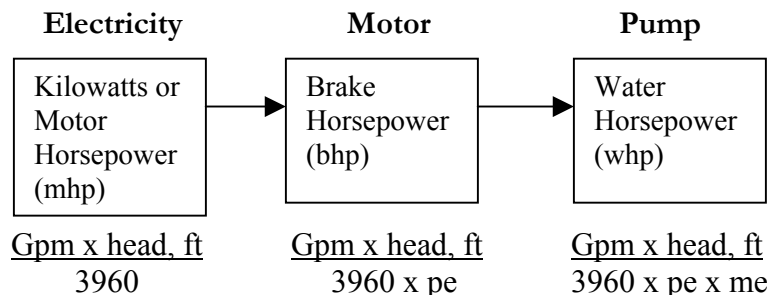
**Water Loss (%) =**  $\frac{\text{Influent} - \text{Effluent}}{\text{Influent}} \times 100\%$

**Specific Gravity =**  $\frac{\text{wt/gal}}{\text{wt of H}_2\text{O/gal}}$

**Specific Yield =**  $\frac{\text{GPM}}{\text{Drawdown}}$

**Chemical Feed Rate:**  
 100% Pure chemical =  
 lbs per day = MGD x 8.34 lbs/gal x (ppm or mg/L)  
 Less than 100% pure chemical =  $\frac{\text{lbs (or gal) pure chemical}}{\text{percent purity}} *$   
 \* insert number from chemical feed equation above

**Horsepower**  
 % pump efficiency (pe), % motor efficiency (me)  
 1 Horsepower = .746 kilowatts power, ¢/Kw-Hr



## GEOMETRY

P = Perimeter = sum of all sides

C = Circumference

A = Area

S.A. = Surface Area

V = Volume

$\pi$  (pi) = 3.14

L = Length

H = Height

W = Width

R = Radius

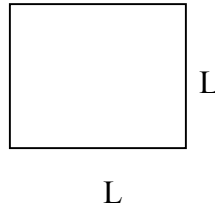
D = Diameter

Radius =  $D \div 2$

### Square

$$P = 4 \times L$$

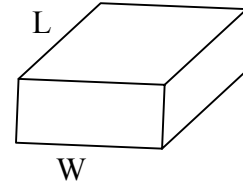
$$A = L \times L$$



### Cube

$$V = H \times L \times W$$

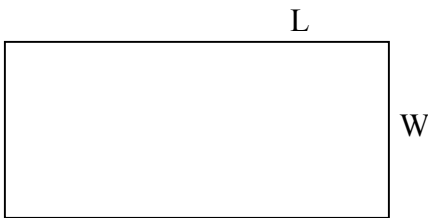
$$S.A. = 6 \times L \times L$$



### Rectangle

$$P = (2 \times L) + (2 \times W)$$

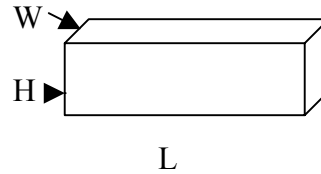
$$A = L \times W$$



### Rectangular Solid

$$V = H \times L \times W$$

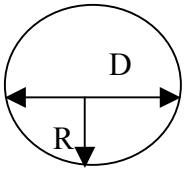
$$S.A. = 2 \times (L \times H) + 2 \times (H \times W) + 2 \times (L \times W)$$



### Circle

$$C = \pi \times D$$

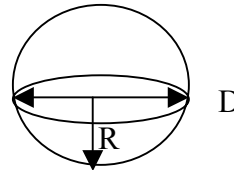
$$A = \pi \times R^2 \text{ or } 0.785 \times D^2$$



### Sphere

$$V = \frac{4}{3} \times \pi \times R^3$$

$$S.A. = 4 \times \pi \times R^2$$

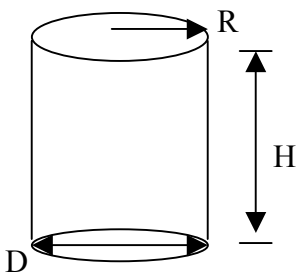


### Cylinder

$$V = \pi \times R^2 \times H \text{ or } V = 0.785 \times D^2 \times H$$

$$S.A. = (2 \times \pi \times R^2) + (\pi \times D \times H) \text{ or};$$

$$S.A. = (2 \times 0.785 \times D^2) + (\pi \times D \times H)$$



### Cone

$$V = \left(\frac{\pi}{3}\right) \times R^2 \times H \text{ or}$$

$$V = 0.785 \times (D^2 \div 3) \times H$$

