

WATER OPERATOR CLASS C AND D CONVERSIONS AND EQUATIONS

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

V = L/T

V = velocity
L = length
T = Time

Q = AxV

Q = flow rate (ft³/sec)
A = cross-sectional area (ft²)
V = velocity (ft/sec)

Detention Time =

Volume of tank

Flow rate to or from tank
T = detention time (sec)
V = volume (ft³)
Q = flow rate (ft³/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:

gal treated = $\frac{\text{volume(ft}^3\text{)} \times \text{gr/ft}^3\text{'}}{\text{gr/gal}}$

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 = $\frac{\text{GPM}}{\text{Drawdown}}$

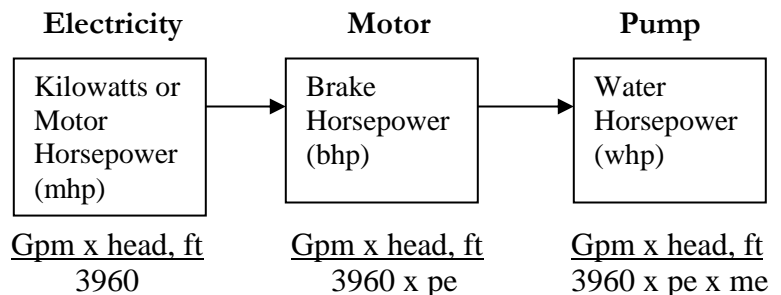
Chemical Feed Rate:

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, ϕ /Kw-Hr



GEOMETRY

P = Perimeter = sum of all sides

C = Circumference

A = Area

S.A. = Surface Area

V = Volume

π (pi) = 3.14

L = Length

H = Height

W = Width

R = Radius

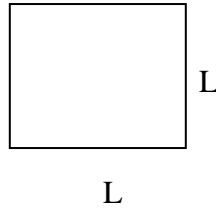
D = Diameter

Radius = $D/2$

Square

$$P = 4 \times L$$

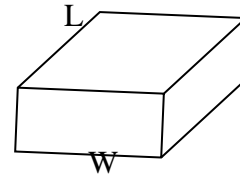
$$A = L \times L$$



Cube

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

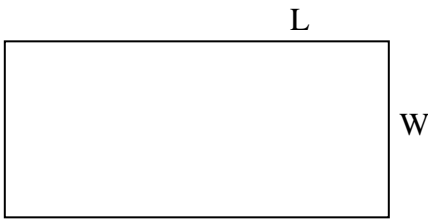
$$S.A. = 6 \times L \times L$$



Rectangle

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

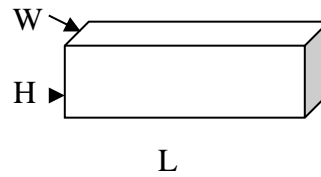
$$A = L \times W$$



Rectangular Solid

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

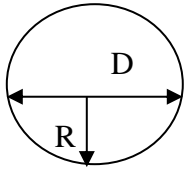
$$S.A. = 2 \times (L \times H) + 2 \times (H \times W) + 2 \times (L \times W)$$



Circle

$$C = \pi \times D$$

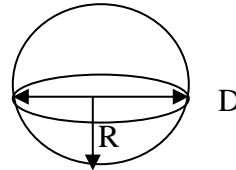
$$A = \pi \times R^2 \text{ or } 0.785 \times D^2$$



Sphere

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

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

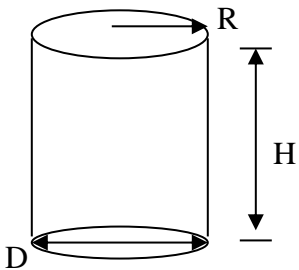


Cylinder

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

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

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



Cone

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

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

