**Equivalents**

1 cubic foot = 7.48 gallons
1 cubic yard = 27 cubic feet
1 gallon of water = 8.34 pounds
1 p.s.i. = 2.31 feet of water
1 foot of head = 0.43 p.s.i.
1 horsepower = 0.746 kilowatts
1 gallon of water = 8.34 pounds
1 MGD = 694 gpm
π (Pi) = 3.14
Radius of circle = diameter ÷ 2
Circumference of circle = π x diameter
Temp. °Centigrade = ([°Fahrenheit - 32] ÷ 1.8) + 32°F
Temp. °Fahrenheit = ([°Centigrade x 1.8] + 32)°F

**Circles/Cylinders**

- Area, sq. ft. = π x radius, ft. x radius, ft.
- Volume, cu. ft. = π x radius, ft. x radius, ft. x height, ft.

**Rectangles**

- Area, sq. ft. = length, ft. x width, ft.
- Volume, cu. ft. = length, ft. x width, ft. x height, ft.

**Cone**

- Volume, cu. ft. = \( \frac{0.33}{6} \) x π x radius, ft. x radius, ft. x height, ft.

**General Formulas**

- Detention Time, hr. = volume, gal. x 24 hr./day ÷ flow, gpd
- Velocity, ft./sec. = flow, cu. ft./sec. ÷ area, sq. ft.
- Velocity, ft./sec. = distance, ft. ÷ time, sec.
- Velocity, ft./sec. = gpm ÷ diameter, in. x diameter, in. x 2.448
- Water HP = flow, gpm x feet of head ÷ 3960
- Brake HP = water horsepower ÷ pump efficiency (decimal %)
- Motor HP = water horsepower ÷ pump efficiency (decimal %) x motor efficiency (decimal %)
- Flow, cu. ft./sec. = area, sq. ft. x velocity, ft./sec.
- Dose, mg/L = chemical feed, lbs./day ÷ flow, MGD x 8.34 lbs./gal.
- Chemical Feed, lbs./day = flow, MGD x dose, mg/L ÷ 8.34 lbs./gal.
- Chemical Feed, lbs. = volume, MG x dose, mg/L ÷ 8.34 lbs./gal.
- Solids Applied, lbs./day = flow, MGD x conc., mg/L ÷ 8.34 lbs./gal.
- % Stroke Setting = required feed, gpd ÷ maximum feed, gpd x 100
- % Removal = (in – out) ÷ in
- Screening Removed = screenings, cu. ft. ÷ flow, MGD
- Day's Supply = total chemical in inventory, lbs. ÷ average use, lbs./day
- $ Cost Per Day = hp x 0.746 x $ rate x hours/day
- Slope = fall, ft. ÷ length, ft.

**Chlorine Formulas**

- Chlorine Dose, mg/L = chlorine demand, mg/L + chlorine residual, mg/L
- Chlorine Residual, mg/L = chlorine dose, mg/L – chlorine demand, mg/L
- Chlorine Demand, mg/L = chlorine dose, mg/L – chlorine residual, mg/L
- Pounds/Day of HTH = lbs./day chlorine needed ÷ decimal % chlorine of HTH
**Water Math**

Filtration Rate, gpm/sq.ft. = \( \frac{\text{flow rate, gpm}}{\text{filter surface area, sq. ft.}} \)

Filter Backwash Rate, gpm/sq.ft. = \( \frac{\text{backwash flow rate, gpm}}{\text{filter surface area, sq. ft.}} \)

Filter Backwash Water % = \( \frac{\text{backwash water, gal.}}{\text{water filtered, gal.}} \times 100 \)

Wash Water, gpm = \( \frac{\text{area, sq. ft.} \times \text{rise, ft.} \times 7.48 \text{ gal./cu. ft.}}{\text{minutes}} \)

Reservoir Volume, ac./ft. = \( \frac{\text{reservoir volume, cu. ft.}}{43,560 \text{ sq. ft./ac.}} \)

Reservoir Volume, gal. = \( \frac{\text{volume, ac-ft.} \times 43,560 \text{ sq. ft./ac.} \times 7.48 \text{ gal./cu. ft.}}{\text{minutes}} \)

Surface Area, ac. = \( \frac{\text{surface area, sq. ft.}}{43,560 \text{ sq. ft./ac.}} \)

Chemical Feed, lbs. = \( \frac{\text{surface area, ac.} \times \text{dose, lbs./ac.}}{\text{minutes}} \)

Mean or Average = \( \frac{\text{sum of values or measurements}}{\text{number of values or measurements}} \)

Median = middle value of a group of data

Specific Yield, gpm/ft = \( \frac{\text{Well Yield, gpm}}{\text{Drawdown, ft.}} \)

Drawdown, ft. = \( \text{Pumping Water Level, ft.} - \text{Static Water Level, ft.} \)

**Wastewater Math**

Grit Removed, cu. ft./MG = \( \frac{\text{volume of grit, cu. ft.}}{\text{volume of flow, MG}} \)

Pond, Detention Time, days = \( \frac{\text{pond volume, ac-ft}}{\text{flow rate, ac-ft/day}} \)

Pond Area, acres = \( \frac{\text{avg. width, ft.} \times \text{avg. length, ft.}}{43,560 \text{ sq. ft./acre}} \)

Pond, Population Loading, = \( \frac{\text{population served, persons}}{\text{pond area, acres}} \)

Pond, Organic Loading = \( \frac{\text{BOD, mg/L} \times \text{flow, MGD} \times 8.34 \text{ lbs./gal.}}{\text{Pond area, acres}} \)

Pond, Hydraulic Loading = \( \frac{\text{depth of pond, inches}}{\text{detention time, days}} \)

Trickling Filter, Organic Loading = \( \frac{\text{BOD applied, lbs/day}}{\text{volume of media, 1,000 cu. ft.}} \)

Sludge Age (in days) = \( \frac{\text{MLSS in aeration tank (lbs.)}}{\text{TSS entering aeration tank (lbs/day)}} \)

Sludge Volume Index (SVI), ml/g = \( \frac{30 \text{ min. settleability test, ml/L} \times 1,000 \text{ mg/g}}{\text{MLSS, mg/L}} \)