WATER DISTRIBUTION EXAM FORMULA SHEET

4/10/15

EQUIVALENTS

1 minute (min) = 60 seconds (sec)
1 hour (hr) = 60 min
1 day = 24 hr = 1,440 min = 86,400 sec
1 inch (in) = 2.54 centimeters (cm)
1 ft = 12 in
1 ft = 0.433 pounds per square inch (psi)
1 psi = 2.31 ft
1 cubic foot (ft^3) = 7.48 gallons (gal) = 62.38 pounds (lbs)
1 ft^3 = 62.38 lbs
1 cubic yard = 27 ft^3
1 gal = 8 pints
1 gal = 8.34 lbs
1 gal = 3.785 liters (L)
1 lb = 454 grams
1 L = 1,000 milliliters (mL)
1 milligrams per liter (mg/L) = 1 part per million (ppm)
1 % = 10,000 ppm
1 cubic foot per second (cfs or ft^3/sec) = 448 gallons per minute (gpm)
1 gpm = 1,440 gallons per day (gpd)
1 gpd = 2.63 mL/min
1 million gallons per day (MGD) = 694.4 gpm
1 grain per gallon (gpg) = 17.12 mg/L
π (pi) = 3.14

ABBREVIATIONS

V = volume	A = area
v = velocity	D = diameter
Q = flow	r = radius
ft^2 = square feet	C = circumference
DT = detention time	

TEMPERATURE

Fahrenheit (°F) = (1.8 x °C) + 32
Celsius (°C) = (°F - 32) x 0.56

CIRCUMFERENCE, AREA & VOLUME

Circumference (C, ft) = π x D (ft)

Area of a rectangle (A, ft^2) = length (ft) x width (ft)
Area of a circle (A, ft^2) = 0.785 x D $(ft)^2$
Area of a circle (A, ft^2) = π x r $(ft)^2$

Volume of a rectangle (V, ft^3) = length (ft) x width (ft) x height (ft)
Volume of a rectangle (V, gal) = length (ft) x width (ft) x height (ft) x 7.48 (gal/ft^3)

Volume of a cylinder (V, ft^3) = 0.785 x D $(ft)^2$ x height (ft)
Volume of a cylinder (V, gal) = 0.785 x D $(ft)^2$ x height (ft) x 7.48 (gal/ft^3)

CHLORINATION

Chlorine dose (mg/L) = chlorine demand (mg/L) + chlorine residual (mg/L)

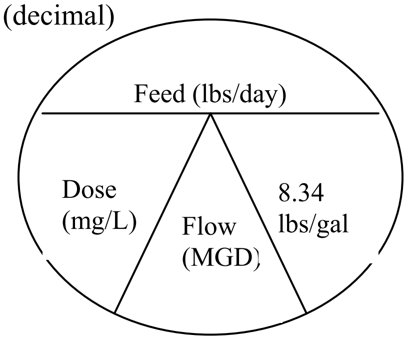
Total chlorine residual (mg/L) = free chlorine residual (mg/L) + combined chlorine residual (mg/L)

POUNDS, DOSAGE & FLOW

Dose (mg/L) = feed (lbs/day) ÷ flow (MGD) ÷ 8.34 (lbs/gal)

Feed (lbs/day) = dose (mg/L) x flow (MGD) x 8.34 (lbs/gal)

Feed (lbs/day) = dose (mg/L) x flow (MGD) x 8.34 (lbs/gal) ÷ % purity (decimal)



Flow (Q, gpm) = volume (V, gal) ÷ time (min)
Flow (Q, gps) = velocity (v, fps) x area (A, ft^2) x 7.48 (gal/ft^3)
Flow (Q, cfs) = velocity (v, fps) x area (A, ft^2)

DETENTION TIME

Detention time (DT, min) = volume (V, gal) ÷ flow (Q, gpm)

MISC

Percent (%) = part ÷ whole x 100
Part = whole x percent ÷ 100

$$\text{Average} = \frac{\text{sum of measurements}}{\text{number of measurements}}$$

$$\text{General ratio} \quad \frac{A1}{A2} = \frac{B1}{B2}$$

Turnover or drawdown (ft) = pumping (ft) – static (ft)

$$\text{Dry chemical feeder (lbs/day)} = \frac{\text{chemical applied (lbs)}}{\text{length of application (day)}}$$

$$\text{Solution chemical feeder (lbs/day)} = \frac{\text{chem conc. (mg/L) x V pumped (mL) x 1,440 (min/day)}}{\text{time pumped (min) x 1,000 (mL/L) x 1,000 (mg/g) x 454 (g/lb)}}$$

$$\text{Hypochlorite flow (gpd)} = \frac{\text{container area (ft}^2\text{) x drop (ft) x 7.48 (gal/ft}^3\text{) x 24 (hr/day)}}{\text{time (hr)}}$$

$$\text{Feed rate (gpd)} = \frac{\text{feed rate (lbs/day) x feed dose (mg/L)}}{\text{feed solution (mg/L)}}$$

$$\text{Feed rate (lbs/day)} = \frac{\text{feeder setting (lbs/day)}}{\text{24 hr/day}}$$