

SECTION 3 - SUMMARY OF KEY WATER PLANT OPERATOR MATH FORMULAS

Most mathematics problems found on Grade I - IV level examinations are process control problems that are responsive to a host of math formulas that have been developed over a period of time to provide each operator with immediate control information with regard to the operation of his/her water plant or water distribution system.

The working formulas in this workbook have been arranged according to process application for easier identification and memorization. A **working formula**, compared to a root, or partially completed formula, is ready for use as written. Simply match up the working formula to the information given in a problem, then substitute the given information from the problem into the letter designations listed within each formula. From that point on, it's simply a matter of following established algebraic practice and crunching numbers until a final solution is finally arrived at. If you have trouble matching formulas with word problems, ask about the **Key Words to Formulas** tri-fold translation cards and **blue math summary card** that are both available at no charge.

It is important to memorize as many working formulas as possible before sitting for an examination to reduce your reliance on examination site handout sheets which often contain too few formulas, partial formulas, infrequently used formulas, or mixed water - wastewater formulas in no special order that do little to assist your efforts. Occasionally, some formulas have even been written incorrectly.

The working formulas in this section of the workbook have also been published in the form of **algebraic pie wheels**, flash cards known as **FlashMATH!** publications, 90 - 150 minute **VHS mathematics video tapes** and **CD - ROMs**. All are designed for self-study.

SECTION - 3
KEY WATER PLANT MATH FORMULAS

General:

1.	Lbs/Day	=	(Vol, MGD) x (Conc., mg/l) x 8.34 lbs/gal)
2.	Dosage, mg/l	=	$\frac{(\text{Feed, lbs/day})}{(\text{Vol, MGD}) \times 8.34 \text{ lbs/gal}}$
3.	Rectangular Basin Volume, cu. ft.	=	(Length, ft) x (Width, ft) x (Height, ft)
	i) Vol, Gals	=	Multiply the above by the factor 7.48 gals/cu.ft.
4.	Right Cylinder Volume, cu. ft.	=	$(0.785) \times (D^2, \text{ft.}) \times (\text{Height or Depth, ft})$
	i) Vol, Gals	=	Multiply the above by the factor 7.48 gals/cu.ft.

5. Conical Base = $\frac{(0.785) \times (D^2, \text{ft}) \times (\text{Height or Depth, ft})}{3}$
Volume, cu. ft.
- i) Vol, Gals = Multiply the above by the factor 7.48 gals/cu.ft.
6. Trapezoid, Volume = $\frac{(\text{B}_1 + \text{B}_2)}{2} \times \text{Height, ft} \times \text{Length, ft.}$
cu. ft.
- i) Vol, Gals = Multiply the above by the factor 7.48 gals/cu.ft.
7. Removal, Percent = $\frac{(\text{In} - \text{Out})}{\text{In}} \times 100$
8. Decimal Fraction = $\frac{(\text{Percent})}{100}$

GPCD means Gallons Per Capita Per Day. A Capita is one (1) person.

$$9. \quad \text{Gals/Day of Water Consumption, (Demand/Day)} = (\text{Population}) \times (\text{Gals/Capita/Day})$$

Consumption Averages, per capita:

1. Winter - 170 GPCD
2. Spring - 225 GPCD
3. Summer - 325 GPCD

$$10. \quad \text{Gals/Capita/Day, Average Water Usage} = \frac{(\text{Vol, Gals/day})}{(\text{Population, Served per day})}$$

$$11. \quad \text{Supply, Days (Full to Tank Dry)} = \frac{(\text{Vol, Gals/day})}{(\text{Population Served}) \times (\text{GPCD})}$$

$$12. \quad \text{GPD} = \frac{(\text{Meter Read 2, Gals} - \text{Meter Read 1, Gals})}{(\text{Number of Days})}$$

$$13. \quad \text{GPH} = \frac{(\text{Volume, gallons})}{(\text{Pumping Time, min.} \times 60 \text{ Min/Hr})}$$

$$14. \quad \text{Time, Hrs.} = \frac{(\text{Volume, gallons})}{(\text{Pumping Rate, GPM} \times 60 \text{ Min/Hr})}$$

$$15. \quad \text{Supply, Hrs. (Full to Tank Dry)} = \frac{(\text{Storage Volume, Gals})}{(\text{Flow In, GPM} - \text{Flow Out, GPM}) \times 60 \text{ min/hr.}}$$

$$16. \quad \text{GPD Combined Consumption} = (\text{Pump In, GPD}) + (\text{Clearwell Storage Volume, GPD Used})$$

$$17. \quad \text{Percent (\%) of Increase} = \frac{(\text{Larger Amount})}{(\text{Smaller Amount})} - 1.0 \times 100$$

SECTION 3 - SUMMARY OF KEY WATER PLANT OPERATOR
MATH FORMULAS - Continued

Chlorine Feed, Dosage/Demand/Residual:

Gas Chlorine Feed, Lbs/day

1. **Lbs/Day** = **(Vol, MGD) x (Conc., mg/l) x (8.34 lbs/gal)**

Dosage, mg/l = **$\frac{(\text{ Lbs/day })}{(\text{ MGD }) \times (8.34 \text{ lbs/gal })}$**

65% HTH Feed, Lbs/day - Calcium Hypochlorite

2. **HTH, lbs/Day** = **$\frac{(\text{Vol, MGD}) \times (\text{ Conc., mg/l}) \times (8.34 \text{ lbs/gal})}{(0.65)}$**

Dosage, mg/l = **$\frac{(\text{ Lbs/day } \times 0.65)}{(\text{ MGD }) \times (8.34 \text{ lbs/gal })}$**

Lbs, 65% HTH = **$\frac{(\text{ Gals of Water } \times 8.34 \text{ lbs/gal }) \times \% \text{ Solution}}{(0.65)}$**

5-1/4% - 12.5% Liquid Chlorine - Sodium Hypochlorite

3. **Lbs/Gal** = **$\frac{(\text{ Solution Percentage }) \times 8.34 \text{ lbs/gal} \times \text{ S.G.}}{100}$**

GPD = **$\frac{(\text{Vol, MGD}) \times (\text{ Conc., mg/l}) \times (8.34 \text{ lbs/gal})}{(\text{ Lbs/gal })}$**

Dosage/Demand/Residual

4. **Dosage, mg/l** = **(Demand, mg/l) + (Residual, mg/l)**

5. **Demand, mg/l** = **(Dosage, mg/l) - (Residual, mg/l)**

6. **Residual, mg/l** = **(Dosage, mg/l) - (Demand, mg/l)**

MATH FORMULAS - Continued

C●t Calculations

$$1. \quad C \bullet t = (\text{Chlorine Residual, mg/L}) \times (\text{Time, minutes})$$

$$2. \quad \text{Time, minutes} = \frac{(C \bullet t)}{(\text{Chlorine Residual, mg/L})}$$

$$3. \quad \text{Chlorine Residual, mg/L} = \frac{(C \bullet t)}{(\text{Time, minutes})}$$

$$4. \quad \text{Inactivation Ratio} = \frac{(\text{Actual System } C \bullet t)}{(\text{Table "E" } C \bullet t)}$$

$$5. \quad C \bullet t \text{ Calculated} = T_{10} \text{ Value, minutes} \times \text{Chlorine Residual, mg/L}$$

$$6. \quad \text{Log Removal} = \frac{(1.0 - \% \text{ Removal})}{100} \times \text{Log key} \times (-)$$

SECTION 3 - SUMMARY OF KEY WATER PLANT OPERATOR
MATH FORMULAS - Continued

Fluoridation:

1.	Feed, = Lbs/day	=	(MGD)	x	$\left(\frac{\text{mg/L}}{\frac{\% \text{ Purity}}{100} \times \frac{\% \text{ Fluoride}}{100}} \right)$	x	8.34 lbs/gallon x S.G.
2.	Adjusted Feed, Lbs/day	=	(MGD)	x	$\left(\frac{\text{Desired, mg/L} - \text{Existing mg/L}}{\frac{\% \text{ Purity}}{100} \times \frac{\% \text{ Fluoride}}{100}} \right)$	x	8.34 lbs/gallon x S.G.
3.	Dosage, mg/L	=	$\frac{\left(\frac{\text{Feed, Lbs/day} \times \frac{\% \text{ Purity}}{100} \times \frac{\% \text{ Fluoride}}{100}}{\text{(MGD)} \times 8.34 \text{ lbs/gallon} \times \text{S.G.}} \right)}$				

**SECTION 3 - SUMMARY OF KEY WATER PLANT OPERATOR
MATH FORMULAS - Continued**

1. Hydraulic (Water Column Height) Pressure :

i) PSI = $\frac{(\text{Head, ft.})}{2.31 \text{ ft./PSI}}$

ii) PSI = Head, ft. x 0.433 PSI/ft.

Or,

iii) Head, ft. = PSI x 2.31 ft./PSI

iv) Head, ft = $\frac{\text{PSI}}{0.433 \text{ PSI/ft.}}$

Pounds of Force On The Face of a Valve

2) Force, lbs = (Area, Sq. Inches) x PSI,

Or,

3) Force, lbs = $(0.785)(D, \text{ft.})^2 \times 144 \text{ sq.in./sq.ft.} \times \text{PSI}$.

Tank Bottom Force and Buoyancy

Tank Bottom Forces:

Rectangular Basins

4) Force, lbs = L, ft x W,ft, x H, ft, x 62.4 lbs/cubic foot

Right Cylinders

5) Force, lbs = $(0.785)(D, \text{ft.})^2 \times \text{Height, ft.} \times 62.4 \text{ lbs/cu.ft.}$

Pounds Per Square Foot on a Tank Bottom:

Rectangular Basins

6) Force, lbs = $\frac{L, \text{ft} \times W, \text{ft}, \times H, \text{ft}, \times 62.4 \text{ lbs/cubic foot}}{(\text{Bottom Area, sq. ft.})}$

Right Cylinders

7) Force, lbs = $\frac{(0.785)(D, \text{ft.})^2 \times \text{Height, ft.} \times 62.4 \text{ lbs/cu.ft.}}{(\text{Bottom Area, sq. ft.})}$

Change of Direction

8. Force, lbs = $2 \times [\text{Area, sq.in.} \times \text{Pressure, } P_{Si}] \times (1/2 \text{ Sin } \theta)$
 (Any Bend)

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MATH FORMULAS - Continued

Pumps and Pumping:

1. Pumping Rate:

$$\text{Volume, Gals} = \text{GPM} \times \text{Time, minutes}$$

$$\text{Rate, GPM} = \frac{(\text{Tank Volume, Gals})}{(\text{Time, minutes})}$$

$$\text{Time, minutes} = \frac{(\text{Tank Volume, Gals})}{(\text{Fill Rate, GPM})}$$

2. Pump Size:

$$\text{Water Horsepower} = \frac{(\text{GPM}) \times (\text{Total Head, ft})}{(3,960)}$$

$$\text{Brake Horsepower} = \frac{(\text{GPM}) \times (\text{Total Head, ft})}{(3,960) \times (\% \text{ Efficiency})}$$

$$\% \text{ Overall Effic. (Pump/Motor)} = (\text{Motor, \% Effic.} \times \text{Pump \% Effic.})$$

3. Pumping Cost:

$$\text{Cost, \$} = (\text{BHp}) \times (0.746 \text{ Kw/Hp}) \times (\text{Operating Hrs.}) \times \frac{\text{¢/Kw-Hr.}}{100}$$

4. Wells:

$$\text{Drawdown, ft.} = \text{Pumping Level, ft.} - \text{Static Level, ft.}$$

$$\text{Specific Capacity, GPM/ft.} = \frac{\text{Well Yield, GPM}}{\text{Drawdown, ft.}}$$

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MATH FORMULAS - Continued**

Strength of Solutions:

1. **Chemical Feed Pumps:**

$$\text{GPD} = \frac{(\text{Required Feed, Lbs/Day})}{(\text{Dry lbs/Gal})} = \frac{(\text{MGD}) \times \text{mg/L} \times 8.34 \text{ lbs/gal}}{(\text{Dry Lbs/gal})}$$

2. **Chemical Feed Rate:**

$$\text{GPD} = \frac{(\text{Feed, ml/min.} \times 1,440 \text{ min/day})}{(1,000 \text{ ml/L} \times 3.785 \text{ L/Gal})}$$

$$\text{GPM} = \frac{(\text{Feed, ml/min.})}{(3,785 \text{ ml/Gal})}$$

$$\text{ml/min} = \frac{(\text{GPD} \times 1,000 \text{ ml/L} \times 3.785 \text{ L/Gal})}{(1,440 \text{ min/day})}$$

$$\text{ml/min} = (\text{GPM} \times 3,785 \text{ ml/Gal})$$

3. Lbs/gallon = $\frac{(\% \text{ Solution})}{(100)} \times 8.34 \text{ lbs/gallon} \times (\text{Specific Gravity})$

4. Lbs Chemical Solution = Specific Gravity x 8.34 lbs/gallons x Gallons of Solution

5. Specific Gravity = $\frac{(8.34 \text{ lbs/gallon} + \text{Chemical Wt., Lbs/gallon})}{(8.34 \text{ lbs/gallon})}$

6. Specific Gravity, Lbs/gallon = $(\text{S.G.} \times 8.34 \text{ lbs/gal}) - (8.34 \text{ lbs/gal})$

7. % Percent of Chemical in Solution = $\frac{(\text{Dry Chemical, Lbs})}{(\text{Dry Wt. Chemical, Lbs}) + (\text{Water, Lbs})} \times 100$

8. Two-Normal Equations:

a) $C_1 V_1 = C_2 V_2$

b) $\frac{Q_1}{V_1} = \frac{Q_2}{V_2}$

9. Three Normal equations:

a) $(C_1 V_1) + (C_2 V_2) = (C_3 V_3)$

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MATH FORMULAS - Continued

Sedimentation Tanks and Clarifiers:

Hydraulic Cross-check Formulas:

1. **Surface Loading Rate, GPD/sq ft.** = $\frac{(\text{Total Flow, GPD})}{(\text{Surface Area, sq.ft.})}$
Design Data: 800 - 1,200 GPD/Sq.ft.
2. **Detention Time, Hrs.** = $\frac{(\text{Volume, gals}) \times (24 \text{ Hrs./day})}{(\text{Total 24 Hr. Flow, Gals/day})}$
Design Data: 1 - 4 Hours; Average 2.5 Hrs.
3. **Flow, GPD** = $\frac{(\text{Volume, gals}) \times (24 \text{ Hrs./day})}{(\text{Detention Time, Hrs.})}$
4. **Weir Overflow Rate, GPD/L.F.** = $\frac{(\text{Flow, GPD})}{(\text{Weir length, ft.})}$
Design Data: 10,000 - 40,000 GPD/LF; Average 20,000 GPD/L.F.
5. **Circumference, ft** = $3.141 (\text{Pi}) \times \text{Diameter, ft.}$
6. **Solids Loading Rate, lbs/day/sq. ft.** = $\frac{(\text{Solids into Clarifier, lbs/day})}{(\text{Surface Area, sq. ft.})}$
7. **Sludge Solids, lbs** = $(\text{Flow, Gals}) \times (8.34 \text{ lbs/gal}) \times (\text{Sludge, \%})$
8. **Raw Sludge Pumping, gpm** = $\frac{(\text{Settleable Solids, ml/L}) \times (\text{Plant Flow, GPM})}{(1,000 \text{ mls/L})}$
9. **Sludge Volume Index, mg/l (SVI)** = $\frac{(\text{Settled Sludge Volume, ml/l}) \times (1,000 \text{ mg/G})}{(\text{Suspended Matter, mg/l})}$
10. **mg/l** = $\frac{(\text{ml} \times 1,000,000)}{(\text{ml sample})}$

SECTION 3 - SUMMARY OF KEY WATER PLANT OPERATOR
MATH FORMULAS - Continued

Filtration:

1.	Filter Flow Rate:		
	Filtration Rate, GPM	=	(Filter Area, sq.ft.) x (GPM/sq.ft.)
2.	Filtration Rate, GPM/sq.ft.	=	<u>(Flow Rate, GPM)</u> (Filter Area, sq.ft.)
3.	Filtration Rate, GPD	=	(Filter Area,sq.ft.) x (GPM/sq.ft.) x 1,440 min/day
4.	Backwash Rate:		
	Backwash Pumping Rate, GPM	=	(Filter Area,sq.ft.) x (Backwash Rate, GPM/sq.ft.)

5. Backwash Volume, Gallons = (Filter Area,sq.ft.) x (Backwash Rate, gpm/sq.ft.) x (Time, min).
6. Backwash Rate, GPM/sq.ft. = $\frac{\text{(Backwash Volume, gpm)}}{\text{(Filter Area, sq.ft.)}}$
7. Backwash, GPM = (Filter Area, sq.ft.) x (Height, Rise/Fall/Drop, ft/min) x (7.48 gals/cu.ft.)
8. Rate of Rise, gals/cu.ft.) GPM/Sq. Ft. = (Height, Rise/Fall/Drop, ft/min) x (7.48
9. Rate of Rise, GPM/sq.ft. = (Time, min) x (Height, ft.) x 7.48 gals/cu.ft.

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MATH FORMULAS - Continued**

Velocity:

1.	Q, cfs	=	(Area, sq. ft.) x (Velocity, fps)
	$\frac{(\text{GPM})}{(448.8 \text{ GPM/cfs})}$	=	(0.785) x (D, ft) ² x $\frac{(\text{Distance, ft.})}{(\text{Time, seconds})}$
2.	Velocity, fps	=	$\frac{(\text{Q, cfs})}{(\text{Area, sq. ft.})}$
3.	Area, sq. ft.	=	$\frac{(\text{Q, cfs})}{(\text{Velocity, fps})}$

4. Flow Conversions:

Flow, GPM = (Q, cfs) x (448.8 GPM/cfs)

5. Q, Cfs = $\frac{(\text{Flow, GPM})}{(448.8 \text{ GPM/cfs})}$

6. Pipe Diameter, Inches = $\sqrt{\frac{(\text{Area, sq.ft.})}{(0.785)}} \times 12 \text{ inches/ft}$

7. Actual Leakage, GPD/Mile-inch = $\frac{\text{Leak Rate, GPD}}{(\text{Length, Mile}) \times (\text{Diameter, inch})}$

Note: **Minimum Flushing Velocity: 2.5 FPS**
Maximum Pipe Velocity: 5.0 FPS

Key Conversions: **1.55 cfs/mgd** **448.8 GPM/cfs**

**SECTION 3 - SUMMARY OF KEY WATER PLANT OPERATOR
MATH FORMULAS - Continued**

Headloss Due to Friction:

1. Darcy-Weisbach:

$$\text{Headloss, ft} = (f) \frac{L_{ft} \times V^2}{D_{ft} \times 2g} \quad (\text{Use the Moody Diagram for "f"})$$

2. Hazen - Williams

$$Q, \text{ gpm} = 0.28 \times C \times D^{2.63} \times S^{0.54}$$

$$\text{"C" Factor} = \frac{\text{Flow, gpm}}{193.75 (D, ft)^{2.63} \times (\text{Slope})^{0.54}}$$

$$\text{HL/1,000 ft.} = \left(\frac{147.85 \times \text{GPM}}{C \times d^{2.63}} \right)^{1.852}$$

$$V_{\text{fps}} = 1.32 \times C \times R^{0.63} \left(\frac{H}{L} \right)^{0.54}$$

3. Manning

$$C, \text{ cfs} = \frac{1.49 \text{ AR}^{2/3} S^{1/2}}{n}$$

$$\text{Slope} = \left[\frac{\text{CFS} \times n^{2/3}}{1.49 \times \text{A R}^{2/3}} \right]^2$$

SECTION 3 - SUMMARY OF KEY WATER PLANT OPERATOR
MATH FORMULAS - Continued

Ion Exchange:

1. Calcium Hardness as mg/l CaCO₃ = (2.5) x (Calcium, mg/l)
2. Magnesium Hardness as mg/l CaCO₃ = (4.1) x (Magnesium, mg/l)
3. Total Hardness = Calcium + Magnesium Hardness as CaCO₃.
4. Convert Hardness from mg/l to grains/gallon:

$$\text{Grains/gallon} = \frac{(\text{Total Hardness, mg/l})}{(17.1 \text{ mg/l/Grain})}$$

5. Total Exchange Capacity,)
 Kilograins = (Resin Cap., kilograins/cu.ft.) x (Vol, cu.ft.)

6. Total Grains Capacity = Kilograins x 1,000

7. Gals of Soft Water per)
1,000 Service Run = $\frac{(\text{Total Exchange Capacity x Kilograins x 1,000})}{(\text{Total Hardness as CaCO}_3, \text{ Grains/gallon})}$

8. By-Pass Water, GPD)
 = $\frac{(\text{Flow, GPD}) \times (\text{Effluent Hardness, Gr/Gal})}{(\text{Influent Hardness, Gr/Gal})}$

9. By-Pass Water, % = $\frac{(\text{Discharge Hardness, mg/l})}{(\text{Initial Hardness, mg/l})} \times 100$

Ion Exchange Formulas (Continued)

10. Salt, lbs = $\frac{(\text{Capacity, Grains}) \times (\text{Salt, lbs})}{(1,000 \text{ Grains})}$
11. Brine, Gals = $\frac{(\text{Salt Needed, lbs})}{(\text{Salt, lbs/gallon})}$
12. Hardness Removed, Grains = $\frac{(\text{Influent Hardness, mg/l} - \text{Effluent Hardness, mg/l})}{(17.1 \text{ mg/L/Grain})}$
13. % of Soft Water By-pass = $\frac{(\text{Blended Discharge Hardness, mg/L})}{(\text{Initial Hardness, mg/L})} \times 100$
14. GPM By-Pass = $\frac{(\% \text{ By-Pass})}{100} \times (\text{Total Flow, GPM})$
15. Total Flow Thru Softener, GPM = $(\text{Total Flow, GPM}) - (\text{By-Pass Flow, GPM})$

Lime - Soda Ash Softening

16. Lbs Hardness Removed = $(\text{MGD}) \times (\text{Dosage, mg/L}) \times \frac{(\text{Soda Ash - Mol Wt.})}{(\text{Calcium Carbonate Mol. Wt.})} \times 8.34 \text{ lbs/gal}$

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MATH FORMULAS - Continued

Jar Testing:

1.	Dosage, mg/l =	$\frac{(\text{Stock, ml}) \times 1,000 \text{ mg/gram} \times (\text{Conc., Grams/L})}{(\text{Sample Size, ml})}$
2.	Grams/Liter =	$\frac{(\text{mg/l} \times 1,000 \text{ ml})}{(\text{ml} \times 1,000 \text{ mg/l})}$

3.	Alum Reacting, mg/l	=	$\frac{(\text{1.0 mg/l Alum}) \times (\text{Raw Alk., mg/l} - \text{Alk. Present, mg/l})}{(\text{0.45 mg/l Alkalinity})}$
4.	Alkalinity Dosage, mg/l	=	$(\text{Total Alum, mg/l} - \text{Alum Reacting, mg/l})$
5.	Dilute Solution, mg/L	=	$\frac{(\text{mg of Alum dosage}) \times (\text{1,000 ml/L})}{(\text{1.0 ml/L})}$
6.	Grams	=	$\frac{(\text{mg}) \times (\text{1.0 gram})}{(\text{1,000 mg/l})}$
7.	mg/L	=	$\frac{(\text{Grams} \times \text{1,000 mg/L})}{(\text{1.0 gram})}$

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MATH FORMULAS - Continued

Laboratory:

1. TSS (mg/l) = $\frac{\text{Paper Wt. and Dried Solids(g)} - \text{Paper Wt.(g)} \times 1,000,000}{(\text{Milliliters [ml] of Sample})}$

2. Total Solids, mg/l = $\frac{(\text{Residue, mg}) \times 1,000}{(\text{ml sample})}$

3. Total Alkalinity, Mg/l = $\frac{(\text{mls of titrant} \times \text{Normality} \times 50,000)}{(\text{mls of Sample})}$

4. Langelier Index = (pH - pH, Saturated)

5. Concentrations:

$$(\text{Conc. 1}) \times (\text{Volume 1}) = (\text{Conc. 2}) \times (\text{Volume 2})$$

6. mg/l = $\frac{(\text{ml} \times 1,000,000)}{(\text{ml sample})}$

mg/l = ml x 1,000 ml/L

7. mg/l Total Solids = $\frac{(\text{Residue, mg}) \times 1,000}{(\text{ml sample})}$

8. Temperature:

$$F^{\circ} = (C^{\circ} \times 1.8) + 32^{\circ}$$

$$C^{\circ} = \frac{(F^{\circ} - 32^{\circ})}{(1.8)}$$

ABBREVIATIONS

Ac-ft	Acre feet	M	Meter
AFC	Actual fluoride content	M	Mile
C°	Celsius	mg/l Liter	Milligram per
CCF	Hundred Cubic Feet	MGD	Million Gals/Day
Cf	Cubic feet (ft ³)	ml	Milliliter
CFS	Cubic Feet Per Second	msl	Mean Sea Level
F°	Fahrenheit	ppm	Parts per Million
Gal	Gallon(s)	Q	Flow, cu. ft/sec.
GPM	Gallons Per Minute	π	Pi (3.141)
GPD	Gallons Per Day	Sq. ft.	Square feet (ft ²)
GPH	Gallons Per Hour	Sq. Yd	Square Yards (ft ³)
GPCD	Gallons per capita per day	SWD	Side Wall Depth
H	Height	μ g/L	Microgram/Liter
Hp	Horsepower	V	Velocity
BHp	Brake Horsepower	V	Volume
Whp	Water Horse power		
KW-Hrs	Kilowatt hours		
Lbs	Pounds		
Lbs/Day	Pounds per day		
L	Liter		

END

Updated: March, 2002