78. At what rate of feed must a chlorinator, reading pounds of chlorine per 24 hours, be set to apply 10 ppm of chlorine to a flow of 1,000 gpm?

a. 60 lbs. per 24 hours
b. 100 lbs. per 24 hours
c. 120 lbs. per 24 hours
d. 200 lbs. per 24 hours
e. 240 lbs. per 24 hours

lbs = MGD × 8.34 × ppm mg/L

1 MGD = 694 gpm (÷)

$\frac{1,000}{694} = 1.44$ MGD

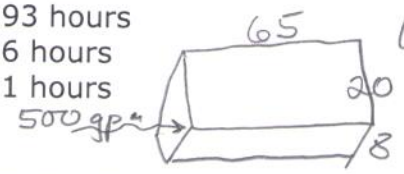
1.44 MGD × 8.34 × 10

lbs = **120.1 lbs**

79. A primary settling tank is 65 ft. long, 20 ft. wide, and 8 ft. average liquid depth. The flow is 500 gpm. What is the detention time?

a. 1.55 hours
b. .76 hours
c. 2.93 hours
d. 2.6 hours
e. 2.1 hours

$DT = \frac{(Vol\ gal \times 24)}{flow\ gpd}$



V = L × W × D × 7.48

V = 65 × 20 × 8 × 7.48 = 77,792 gal

500 × 1440 = 720,000 gpd

$DT = \frac{(77,792 \times 24)}{720,000} =$ **2.59 hr**

80. A circular clarifier has a depth of 10 feet and a diameter of 40 feet. Calculate the detention time in hours, for a flow of 1.13 MGD.

a. 1.5
b. 2.0
c. 2.5
d. 1.73

$DT = \frac{Vol\ gal \times 24}{flow\ gpd}$

V = .785 × D² × depth × 7.48

= .785 × 40 × 40 × 10 × 7.48 = 93,350 g

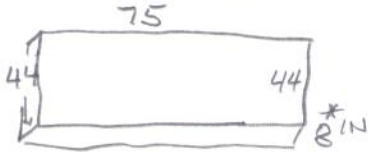
1 MGD = 1,000,000 gpd

1.13 = 1,130,000 gpd

$DT = \frac{(93,350 \times 24)}{1,130,000} =$ **1.98 hr**

81. A sludge bed is 44 ft. wide by 75 ft. long. If the bed is filled 8 in. deep with sludge, how many cubic feet of sludge will be wasted?

V = L × W × D



1 ft = 12 IN (÷)

8/12 = .667 ft

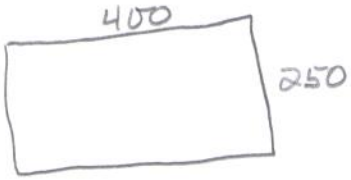
V = 75 × 44 × .667

= **2,201 cu ft OR 2,211 cu ft**

82. How many acres of surface area are contained in a pond 250 ft. x 400 ft.?

A = L × W

1 ac = 43,560 sq ft (÷)



$A = 400 \times 250 = \frac{100,000\ sq\ ft}{43,560} =$ **2.29 ac**

2/29/16

83. It takes dye 2 minutes to travel from one manhole to another. What is the velocity if the points are 300 ft. apart? Is the velocity acceptable?

Vel = ft/sec 2 MIN X 60 sec = 120 sec

300 ft

$\frac{ft}{sec} = \frac{300}{120} =$ **2.5 ft/sec YES!**

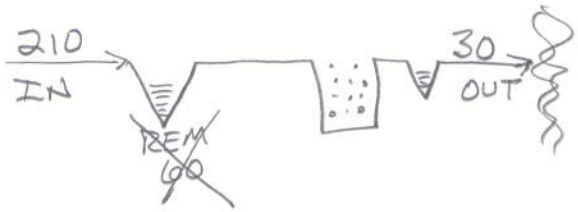
84. The rotameter on your chlorine cylinder indicates you are feeding 66 lbs./day of chlorine. If the average plant flow is 953,000 gpd, what is the chlorine feed rate in mg/L?

$mg/L = \frac{lbs}{(8.34 \times MGD)}$

$mg/L = \frac{66}{(8.34 \times .953)} = \frac{66}{7.948} =$ **8.3 mg/L**

$\frac{953,000}{1,000,000} = .953$ MGD

85. Your plant receives 210 mg/L of BOD, the effluent is 30 mg/L, and the primary clarifier removes ~~60~~ mg/L. What is the overall plant removal efficiency for BOD?

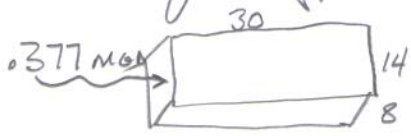


$EFF\% = \frac{(IN - OUT)}{IN} \times 100$

$= \frac{(210 - 30)}{210} \times 100 = \frac{180}{210} \times 100 =$ **85.7%**

86. The Cherry Hill Wastewater plant receives an average flow of .377 MGD. What is the detention time in hours in a primary clarifier that is 30 ft. x 14 ft. x 8 ft. deep?

$DT = \frac{(Vol\ gal \times 24)}{flow\ gpd}$



$V = L \times W \times D \times 7.48$

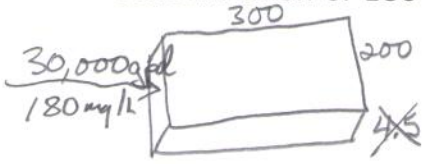
$= 30 \times 14 \times 8 \times 7.48$

$= 25,132.8$ gal

$.377 \times 1,000,000 = 377,000$ gpd

$\frac{25,132.8 \times 24}{377,000} =$ **1.6 hrs**

87. A stabilization pond is 300 ft. long and 200 ft. wide and has an average liquid depth of 4½ feet. The pond receives an average flow of 30,000 gallons a day with an influent BOD concentration of 180 mg/L. What is the pond loading in <u>pounds per day per surface acre</u>?



Pond Loading = $\frac{BOD\ lbs}{Area, AC}$

$\frac{30,000\ GPD}{1,000,000} = .03$ MGD

lbs BOD = MGD x 8.34 x mg/L

$= .03 \times 8.34 \times 180$

$= 45$ lbs/day

$\frac{45}{1.38} =$ **32.6 lbs/AC**

1 AC = 43,560 sq ft ÷

$A = L \times W = 300 \times 200 = \frac{60,000\ sq\ ft}{43,560} = 1.38$ ac

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88. Your supervisor requests that you purchase 10 cubic yards of concrete. The concrete supplier informs you that the cost per cubic yard of concrete is usually $112; however, your works is entitled to a 5% discount at this price. Exclusive of any taxes, what will the 10 cubic yards cost?

10 yds x $112 = $1,120

5% = .05

$1,120 x .05 = $56 discount

1,120 - 56 = $1,064

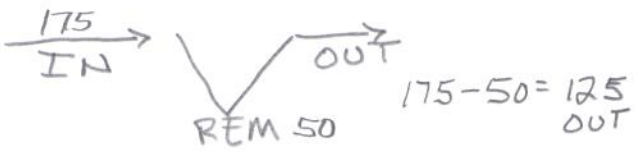
OR: 1,120 x .95 = $1,064

89. The primary clarifier influent BOD is 175 mg/L and the clarifier removes 50 mg/L of BOD. What is the primary clarifier's percentage BOD removal?

EFF% = (IN - OUT) / IN x 100

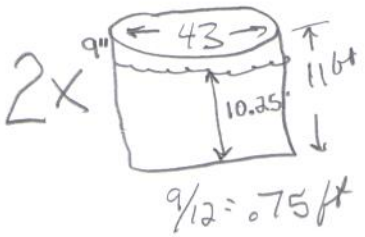
(175-125) / 175 x 100

50/175 x 100 = 28.6%



175 - 50 = 125 OUT

90. The Madison Wastewater plant has two clarifiers each 43 ft. in diameter. They are 11 ft. deep with 9 in. of freeboard. Calculate the total clarifier volume of this plant in gallons. What is the surface area of each clarifier in sq. ft.?



9/12 = .75 ft

V = .785 x D² x depth x 7.48

= .785 x 43 x 43 x 10.25

= 14,877 cuft x 7.48

= 111,283.8 g x 2 = 222,568 g

A = .785 x D²

.785 x 43 x 43 =

1451.5 sq ft

91. A works chlorine residual is 0.7 mg/L and the chlorine demand is 15 mg/L. If the flow is 0.4 mgd, how many pounds of chlorine gas were fed that day?

F = D + R

Feed = 15 + .7 = 15.7 mg/L

lbs = MGD x 8.34 x mg/L

.4 x 8.34 x 15.7 =

52.4 lbs/day

92. Convert 1,250 gpm to mgd.

1 MGD = 694 gpm

1250 / 694 = 1.8 MGD

OR:

1,250 x 1440 = 1,800,000 GPD

1,800,000 / 1,000,000

= 1.8 MGD

93. Convert 4 mgd to cfs.

1 MGD = 1.545 CFS (× to cfs, ÷ to mgd)

$4 \times 1.545 = \boxed{6.18 \text{ CFS}}$

94. Convert 3.82 cfs to mgd.

$\frac{3.82}{1.545} = \boxed{2.47 \text{ MGD}}$

95. The thermometer in your sample refrigerator reads 43° F. Convert to centigrade.

$C = (F - 32) \times .555$

$(43 - 32) \times .555$

$11 \times .555 = \boxed{6.1\,^{\circ}C}$

96. A fecal coliform incubator's water temperature is 44.5° C. Convert this to Fahrenheit.

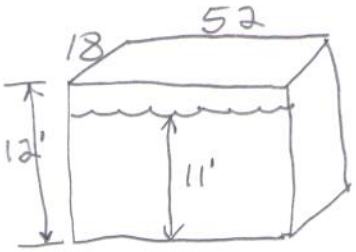
$F = (C \times 1.8) + 32$

$(44.5 \times 1.8) + 32$

$80.1 + 32 = \boxed{112.1\,^{\circ}F}$

97. Calculate the liquid volume in gallons of a clarifier with the following dimensions:

L = 52 ft.
W = 18 ft.
D = 12 ft.
Freeboard = 12 in.



$V = L \times W \times D$

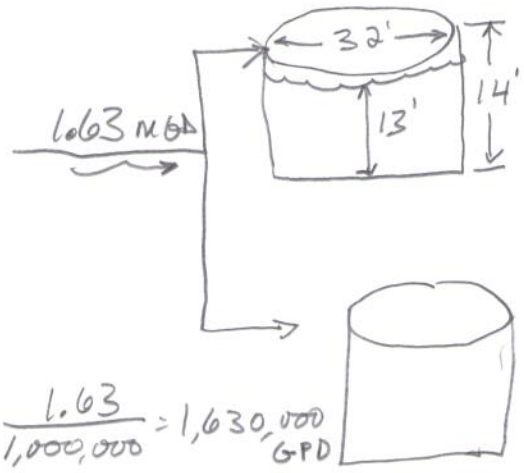
$= 52 \times 18 \times 11$

$= 10{,}296 \text{ cu ft}$

$\times 7.48 = \boxed{77{,}014 \text{ gal}}$

1 cu ft = 7.48 g

98. The Piscataway Wastewater plant has been upgraded to two circular clarifiers, each one 32 ft. in diameter and 14 ft. deep with 12 in. of freeboard. If the <u>total</u> flow to the plant is 1.63 MGD, calculate the Detention time in the clarifiers in hours.



$DT = \frac{(\text{Vol gal} \times 24)}{\text{flow, gpd}} = \frac{156{,}331 \times 24}{1{,}630{,}000} = \boxed{2.3 \text{ hrs}}$

$V = .785 \times D^2 \times \text{depth}$

$\times 7.48$

$= .785 \times 32 \times 32 \times 13$

$10{,}449.9 \text{ cu ft}$

$\times 7.48 \times 2 = 156{,}331 \text{ gal}$

* If you split flow in half + use 1 clarifier = same ans!

2/29/16

99. You have decided to add a new polymer to your belt press which is $17.50 per pound. A 12% cost reduction applies if you purchase over 500 lbs. at one time. How much will you save if you purchase 800 lbs.?

800 lbs x $17.50 = $14,000

12% = .12

Savings = $14,000 x .12 = $1,680

100. Given the data below for August, how many pounds of ammonia will be reported on your DMR?

Avg. flow: 1.33 MGD
Max. flow: 2.95 MGD
Sample date: August 10
* Flow: 1.24 MGD
Ammonia: 2.9 mg/L

*use flow on sample day

lbs = MGD x 8.34 x mg/L

1.24 x 8.34 x 2.9

= 29.99 or 30 lbs