Basic Wastewater Math

NMWWA Southwest Section

Jacob Hands Memorial Workshop
June 17 – 18, 2021

Online

Conversion/Formula Sheet

- Corrections
- How to use portions of the document

Conversions

- Utilizing conversions
- Changes units but not magnitude
- Essentially multiplication by “1”

$$\frac{3}{3} = 1 = \frac{12\text{in}}{1\text{ ft}} = \frac{1\text{ft}}{12\text{ in}} = 1$$

- Important to include units

1. Convert 3.2 miles to feet

- Find the correct conversion factor (Page 3)

1 mile = 5,280 ft

$$\frac{3.2 \text{ miles}}{1} \times \frac{5{,}280 \text{ ft.}}{\text{mile}} = 16{,}896 \text{ ft.}$$

2. 3.2 acres to sq.ft.

- Find the correct conversion factor (Page 1)

1 acre = 43,560 ft^2

$$\frac{3.2\ \cancel{acres}}{1} \times \frac{43{,}560\ ft.^2}{\cancel{acres}} = 139{,}392\ ft.^2$$

3. 678,754 cu.ft to acre-ft.

- Find the correct conversion factor (Page 1)

1 acre-ft = 43,560 ft^3

$$\frac{678{,}754\ \cancel{ft^3}}{1} \times \frac{1\ \text{ac-ft}}{43{,}560\ \cancel{ft.^3}} = 15.58\ \text{ac-ft.}$$

4. 3.7 MGD to gpm

- Find the correct conversion factor (Page 3)

1 MGD = 694.4 gpm

$$\frac{3.7\ \cancel{MGD}}{1} \times \frac{694.4\ gpm}{1\ \cancel{MGD}} = 2{,}569.3\ gpm$$

5. 1,250 gpm to cfs

- Find the correct conversion factor (Page 3)

1 ft^3/sec = 449 gpm

$$\frac{1{,}250\ \cancel{gpm}}{1} \times \frac{1\ ft^3/sec}{449\ \cancel{gpm}} = 2.78\ ft^3/sec$$

6. 0.9 cfs to MGD

- Find the correct conversion factor (Page 3)

1 ft^3/sec = 0.6463 MGD **or** 1 MGD = 1.547 cfs

$$\frac{0.9\ \cancel{ft^3/sec}}{1} \times \frac{0.6463\ MGD}{1\ \cancel{ft^3/sec}} = 0.58\ MGD$$

7. 768 gpm to acre-ft/day

- Find the correct conversion factor (Page 3)

1 MGD = 3.07 acre-ft/day **and** 1 MGD = 694.4gpm

$$\frac{768\ \cancel{gpm}}{1} \times \frac{1\ \cancel{MGD}}{694.4\ \cancel{gpm}} \times \frac{3.07 ac\text{-}ft/day}{1\ \cancel{MGD}}$$

= 3.4 ac-ft/day

8. 5.6 MGD to cfs

- Find the correct conversion factor (Page 3)

1 ft^3/sec = 0.6463 MGD **or** 1 MGD = 1.547 cfs

$$\frac{5.6\ \cancel{MGD}}{1} \times \frac{1\ ft^3/sec}{0.6463\ \cancel{MGD}} = 8.66\ ft^3/sec$$

9. 25ºC to ºF

- Find the correct formula (Page 10)

°F = (°C x 1.8) + 32

(25ºC x 1.8) + 32 = 77ºF

10. 90ºF to ºC

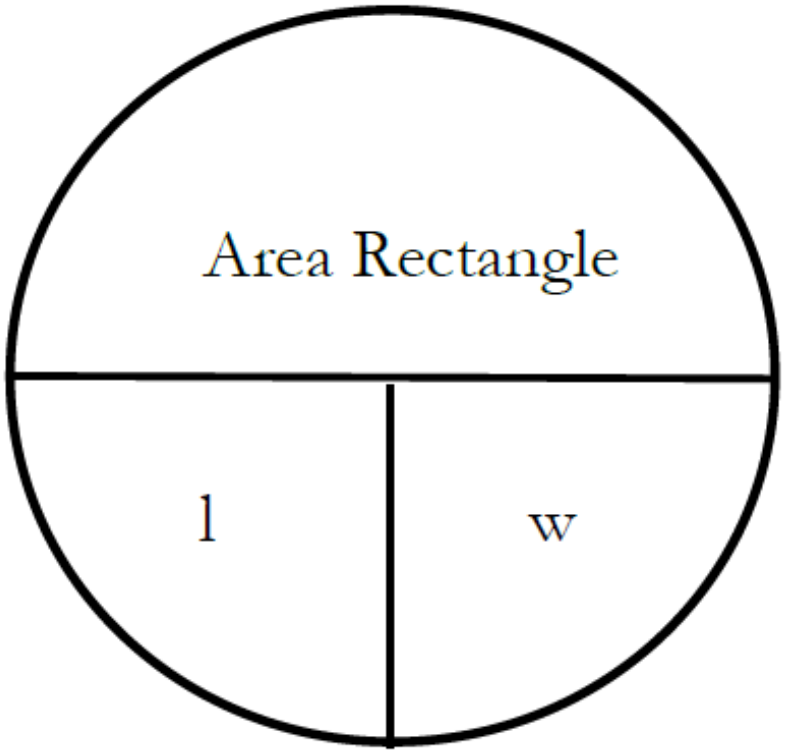
- Find the correct formula (Page 10)

(°F – 32) x (0.556) (corrected)

(90ºF - 32) x 0.556 = 32.2ºC

11. Determine the surface area (exposed water area) of a rectangular clarifier, in sq. ft., if the clarifier is 74 feet in length and 32 feet in width.

- Find the correct formula (Page 4)



l = length of rectangle

w = width of rectangle

Number 11 Calculation

- Length (l) x Width (w)

74 ft. x 32 ft. = 2,368 ft^2

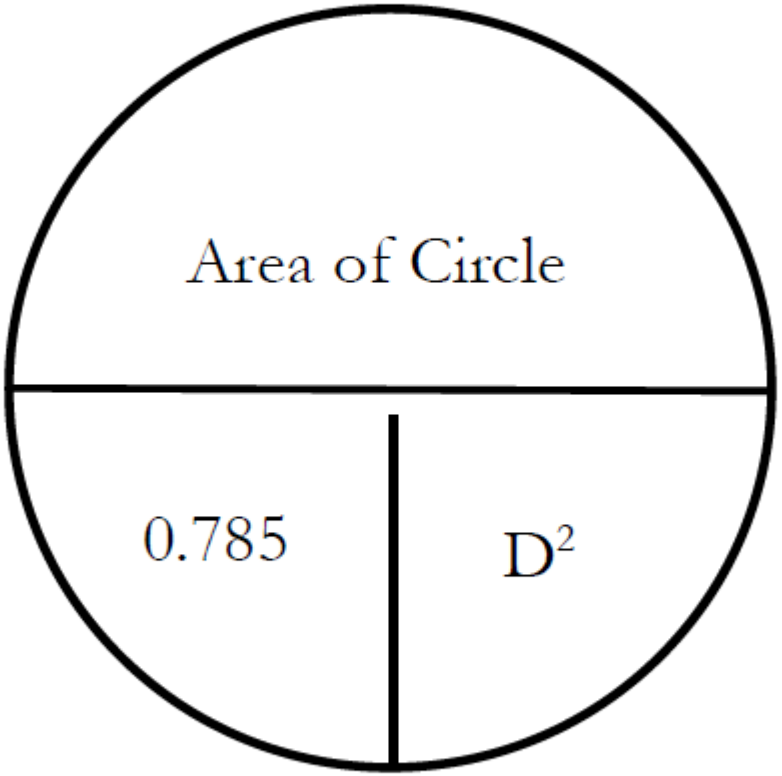
12. A circular clarifier has a diameter of 72 feet and a depth of 31 feet. Determine the surface area (exposed water area) of the clarifier in sq. ft.

- Find the correct formula (Page 4)

Where: $\pi = 3.1416$

r = radius of circle

D = diameter of circle



$$A = \pi r^2$$

Number 12 Calculation

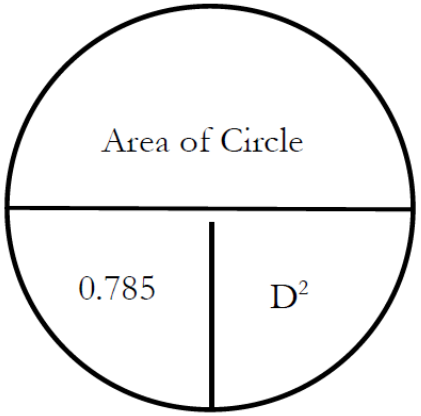
- $0.785D^2$
- 0.785 x D x D

0.785 x 72 ft. x 72 ft. = 4,069 ft^2

13. A trickling filter is 58 feet in diameter and has a media depth of 6 feet. Determine the surface area of the media of the trickling filter, in sq. ft.

- Find the correct formula (Page 4)

Where: $\pi = 3.1416$
r = radius of circle
D = diameter of circle



$$A = \pi r^2$$

Number 13 Calculation

- $0.785D^2$
- 0.785 x D x D

0.785 x 58 ft. x 58 ft. = 2,641 ft^2

14. A pond has a width of 380 feet and a length of 540 feet. Determine the surface area of the pond in acres.

- Find the correct formula (Page 9)
- $A = [(L) \times (W)] / (43{,}560\ ft^2/ac)$

Number 14 Calculation

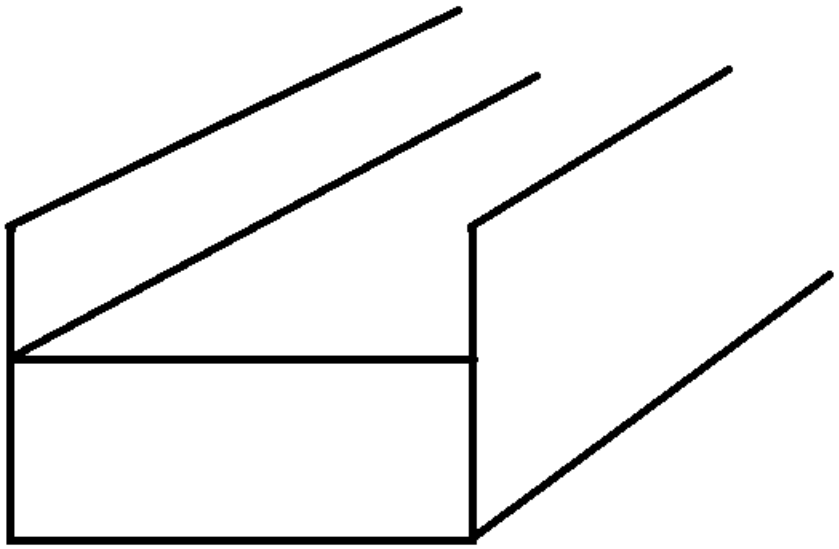
- (Length (l) x Width (w))/(43,560 ft^2/ac)

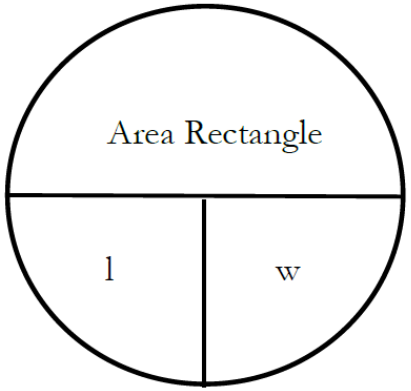
(540 ft. x 380 ft.) ÷(43,560 ft^2/acre)

= 4.7 acres

15. Determine the cross-sectional area, in sq. ft., of the flow in a grit channel which is 2.5 feet in width and flowing to a depth of 1 foot, 3 inches.

- Find the correct formula (Page 4)





l = length of rectangle

w = width of rectangle

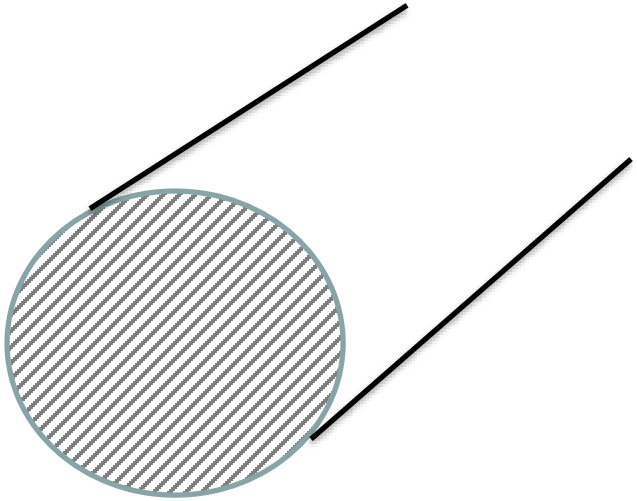
Number 15 Calculation

- Length (l) x Width (w)
- Step 1 is to convert to the same units.
- 1 ft. 3 inches = 1.25 ft.

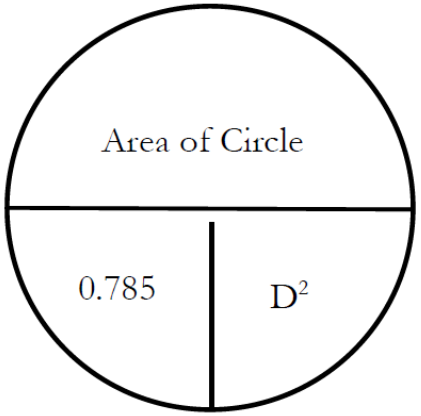
2.5 ft. x 1.25 ft. = 3.1 ft^2

16. Determine the cross-sectional area, in square inches, of a pipe which is 18 inches in diameter.

- Find the correct formula (Page 4)



Where: $\pi = 3.1416$
r = radius of circle
D = diameter of circle



$$A = \pi r^2$$

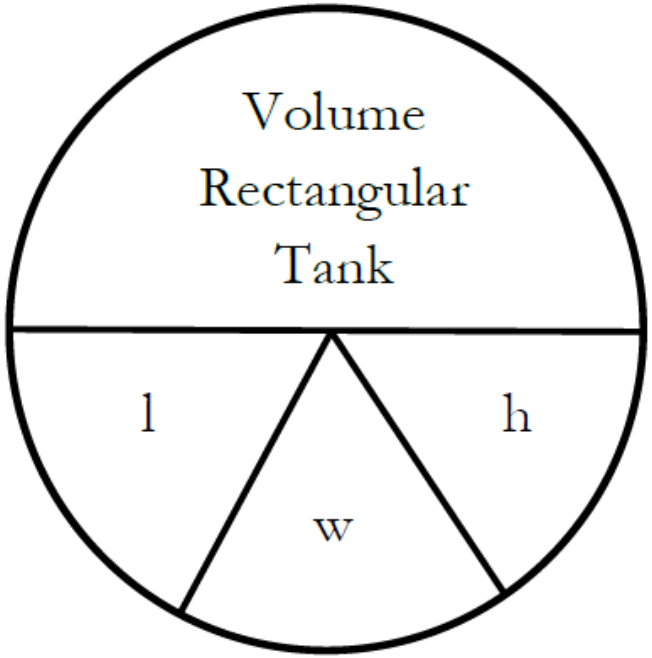
Number 16 Calculation

- $0.785D^2$
- 0.785 x D x D

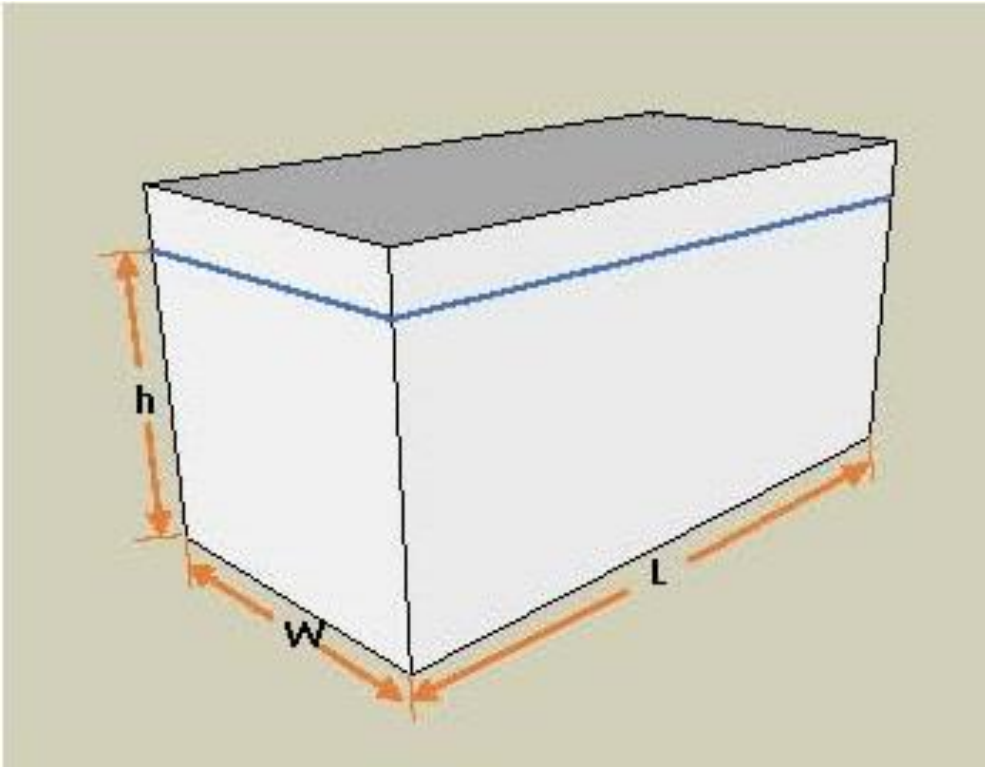
0.785 x 18 in. x 18 in. = 254.34 sq.in.

17. A rectangular clarifier is 58 feet in length, 24 feet in width, and 18 feet in depth. Determine the volume in cubic feet.

- Find the correct formula (Page 4)



Rectangular Tank = (l) x (w) x (h)



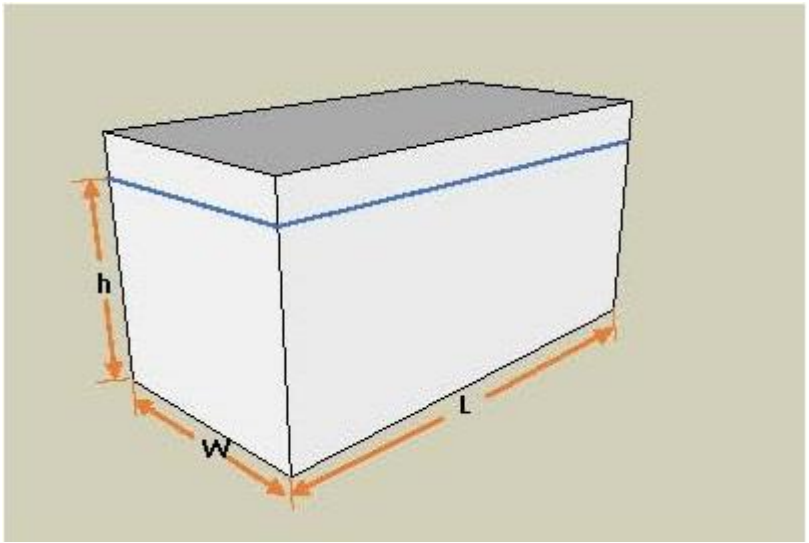
Number 17 Calculation

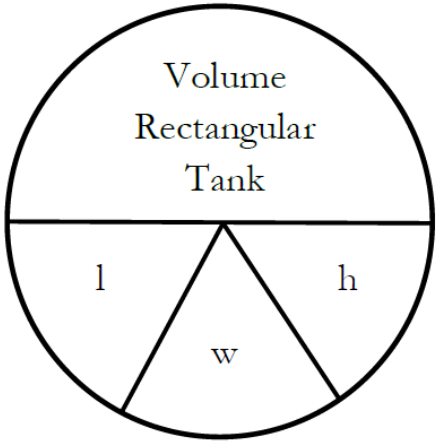
- Length (l) x Width (w) x Height (h)

58 ft. x 24 ft. x 18 ft. = 25,056 ft^3

18. A rectangular clarifier is 62 feet in length, 31 feet in width, and 24 feet in depth. Determine the volume in gallons.

- Find the correct formula (Page 4)





Rectangular Tank = (l) x (w) x (h)

Number 18 Calculation

- Length (l) x Width (w) x Height (h)

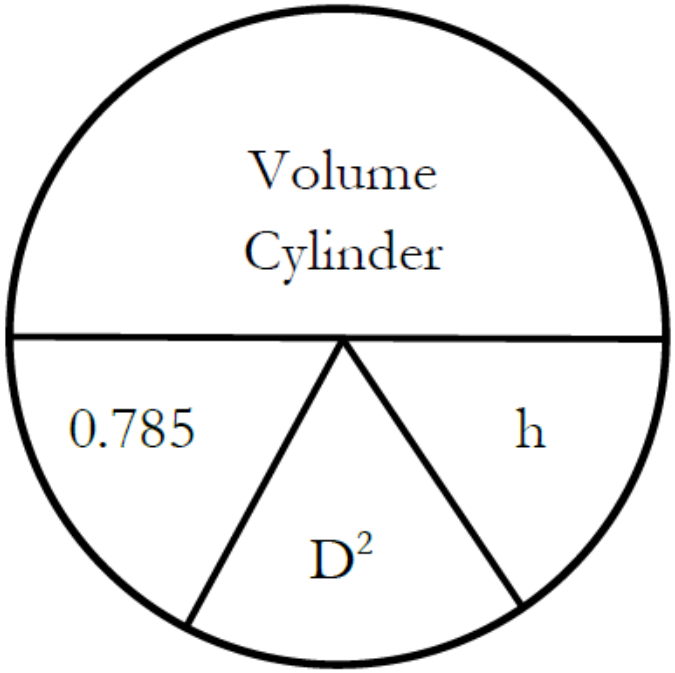
$$62 \text{ ft.} \times 31 \text{ ft.} \times 24 \text{ ft.} = 46{,}128 \text{ ft}^3$$

- Cubic feet must be converted to gallons.

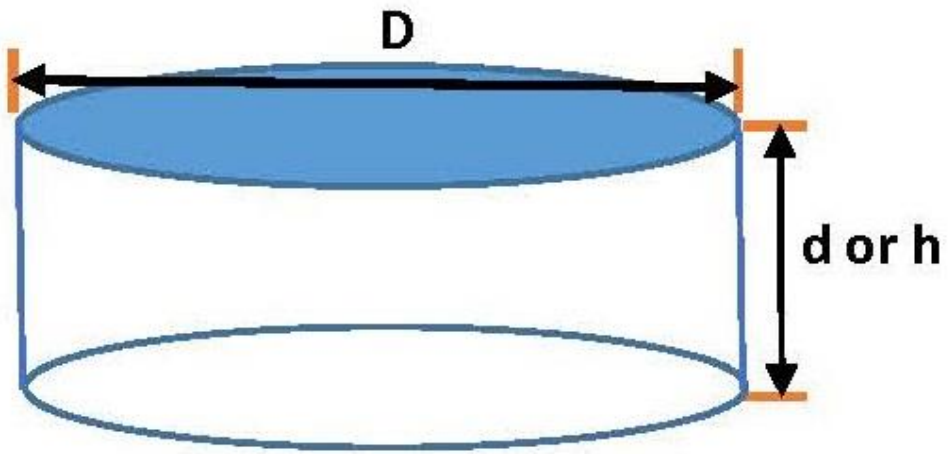
$$\frac{46{,}128 \text{ ft}^3}{1} \times \frac{7.48 \text{ gals}}{1 \text{ ft}^3} = 345{,}037 \text{ gals}$$

19. A circular clarifier is 71 feet in diameter and has a depth of 22 feet. Determine the volume of the clarifier in cubic feet.

- Find the correct formula (Page 4)



Cylinder = (0.785) x (D^2) x (h)



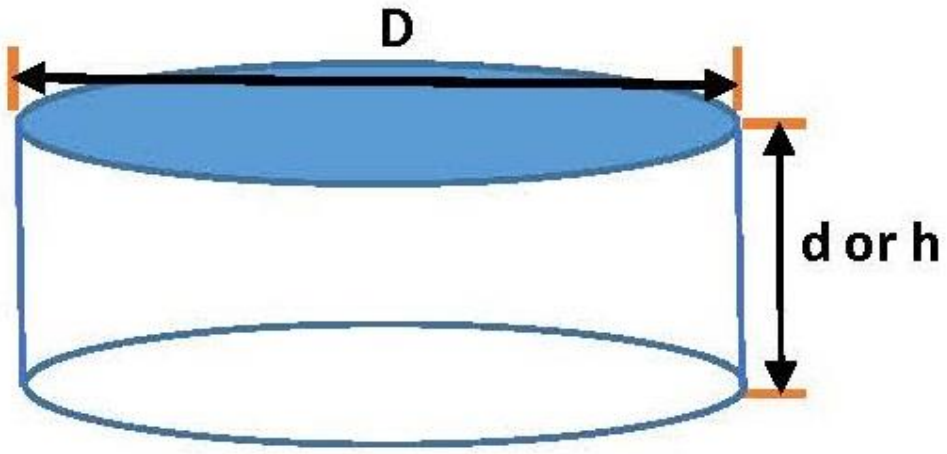
Number 19 Calculation

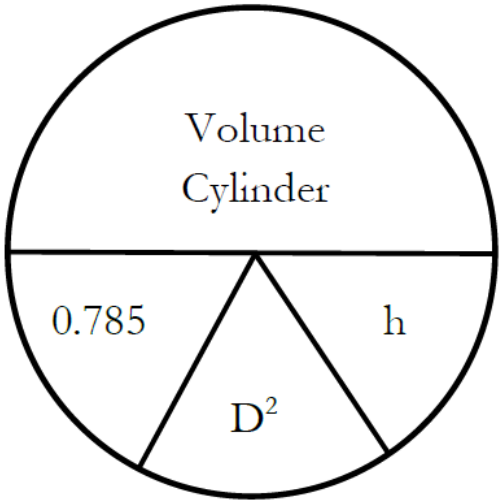
- $(0.785) \times (D^2) \times (h)$
- $0.785 \times D \times D \times h$

$0.785 \times 71 \text{ ft.} \times 71 \text{ ft.} \times 22 \text{ ft.} = 87{,}058 \text{ ft}^3$

20. A circular clarifier is 64 feet in diameter and a depth of 22 feet. Determine the volume of the clarifier in million gallons.

- Find the correct formula (Page 4)





Cylinder = (0.785) x (D^2) x (h)

Number 20 Calculation

- $(0.785) \times (D^2) \times (h)$
- $0.785 \times D \times D \times h$

$$0.785 \times 64 \text{ ft.} \times 64 \text{ ft.} \times 22 \text{ ft.} = 70{,}738 \text{ ft}^3$$

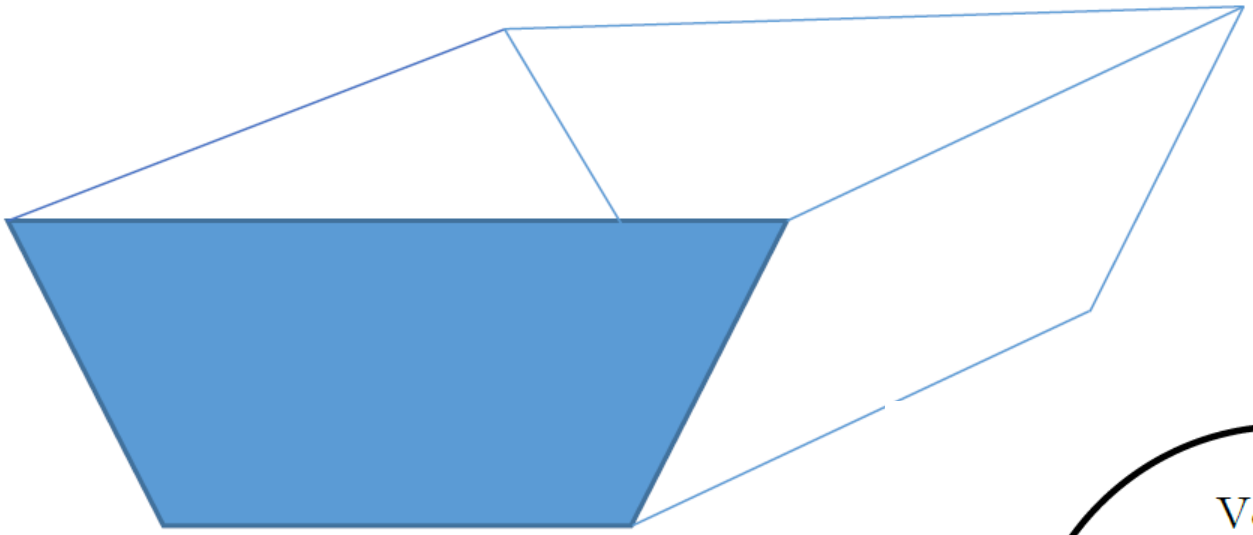
- Cubic feet must be converted to million gallons

$$\frac{70{,}738 \cancel{\text{ft}^3}}{1} \times \frac{7.48 \cancel{\text{gals}}}{1 \cancel{\text{ft}^3}} \times \frac{1 \text{ MG}}{1{,}000{,}000 \cancel{\text{gals}}}$$

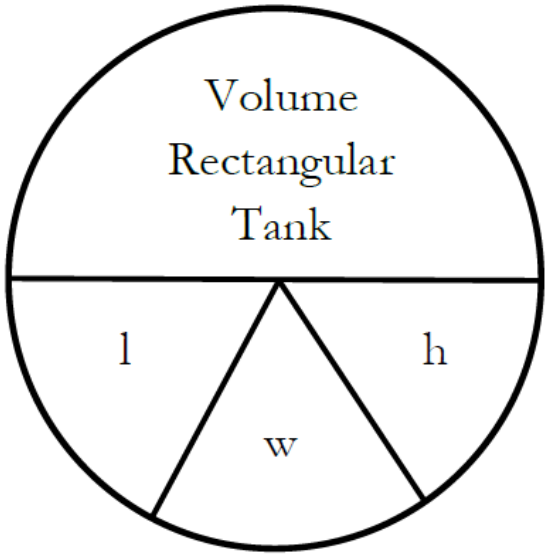
$$= 0.53 \text{ MG}$$

21. A pond has a width of 272 feet, a length of 388 feet, and a depth of 6 feet. Determine the volume of the pond in cubic feet.

- Find the correct formula (Page 4)



Typical shape of ponds but for basic math only the surface area will be calculated.



Rectangular Tank = (l) x (w) x (h)

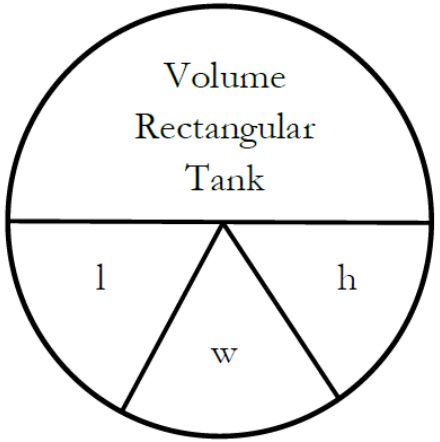
Number 21 Calculation

- Length (l) x Width (w) x Height (h)

388 ft. x 272 ft. x 6 ft. = 633,216 ft^3

22. A pond has a width of 450 feet, a length of 675 feet, and a depth of 5 feet. Determine the volume of the pond in acre-feet.

- Find the correct formula (Page 4 and Page 1)



Rectangular Tank = (l) x (w) x (h)

Number 22 Calculation

- Length (l) x Width (w) x Height (h)

$$675 \text{ ft.} \times 450 \text{ ft.} \times 5 \text{ ft.} = 1{,}518{,}750 \text{ ft}^3$$

- Cubic feet must be converted to acre-feet

$$\frac{1{,}518{,}750 \cancel{\text{ft}^3}}{1} \times \frac{1 \text{ acre-foot}}{43{,}560 \cancel{\text{ft}^3}} = 34.87 \text{ ac-ft}$$

23. A grit channel is 24 feet in length and a stick that has been dropped into the channel travels the length of the channel in 32 seconds. Determine the velocity of flow in the channel.

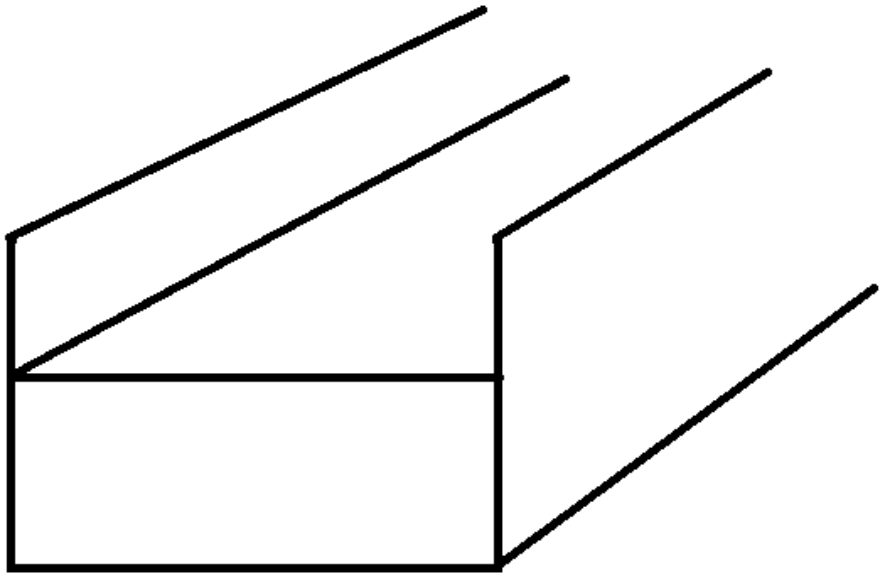
- Find the correct formula (Page 5)

$V = (d)/(T)$

$$\frac{24 \text{ ft}}{32 \text{ sec}} = 0.75 \text{ ft/sec}$$

24. Determine the flow rate, in cfs, in a channel that is 3 feet in width and flowing at a depth of 2 feet if the velocity of flow is 2.0 feet per second.

- Find the correct formula (Page 5)
- Q = (w) x (d) x (V)



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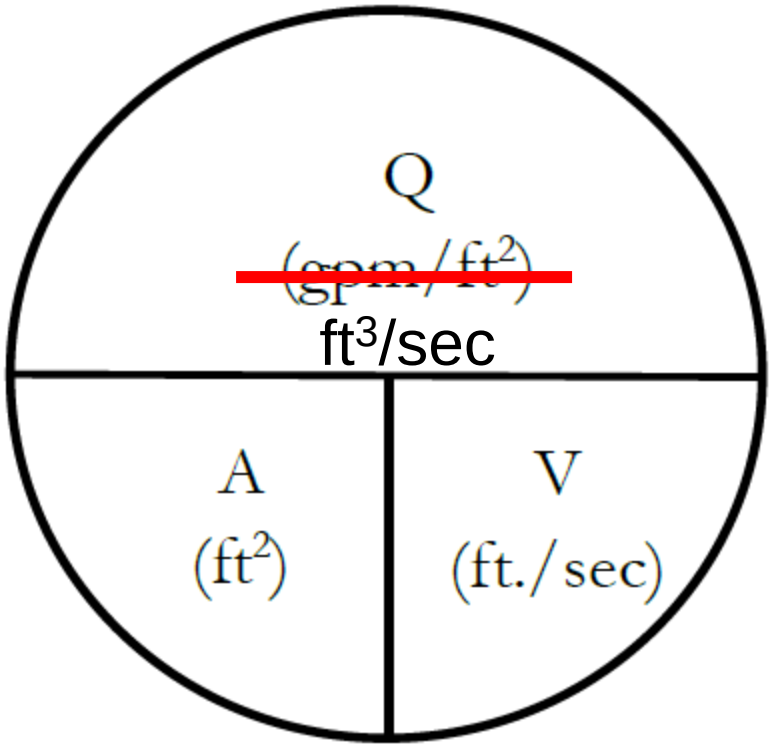


Q = (A) X (V)

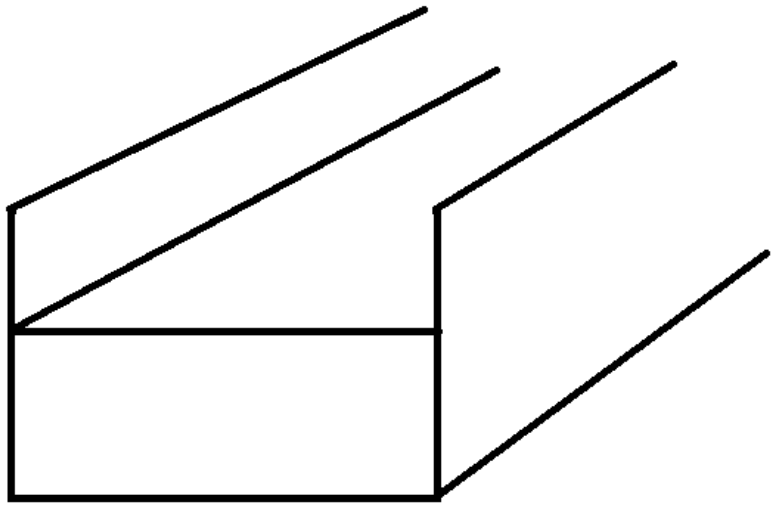
Number 24 Calculation

- Q = (w) x (d) x (V)

3 ft. x 2 ft. x 2 ft./sec = 12 ft^3/sec

25. Determine the flow rate, in million gallons per day, in a channel that is 2 feet in width, 2 feet in depth, flowing half-full at a velocity of 0.9 feet per second.

- Find the correct formula (Page 5)
- Q = (w) x (d) x (V)



Number 25 Calculation

- Q = (w) x (d) x (V)

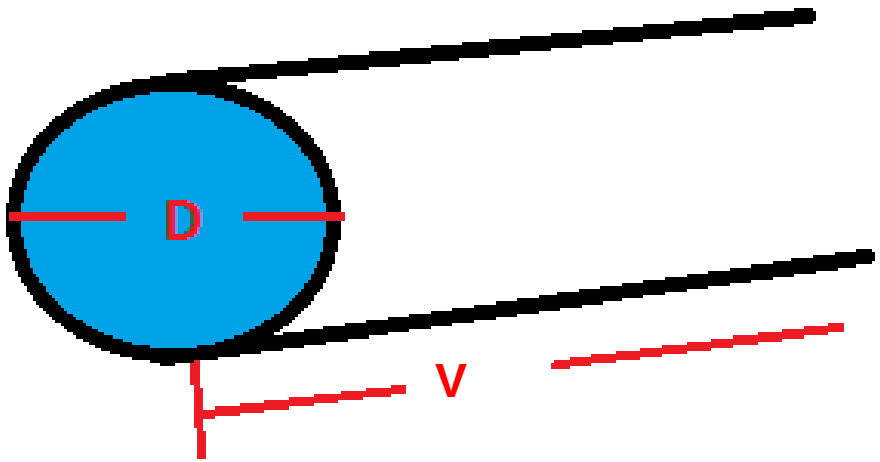
2 ft. x 1 ft. x 0.9 ft/sec = 1.8 ft^3/sec

- Cubic feet/sec must be converted to MGD

$$\frac{1.8\ \cancel{ft^3/sec}}{1} \times \frac{1\ MGD}{0.6463\ \cancel{ft^3/sec}} = 2.79\ MGD$$

26. An 18-inch pipe is flowing full at a velocity of 2.1 feet per second. Determine the flow rate in cubic feet per second.

- Find the correct formula (Page 5)
- $Q = (0.785) \times (D)^2 \times (V)$



Number 26 Calculation

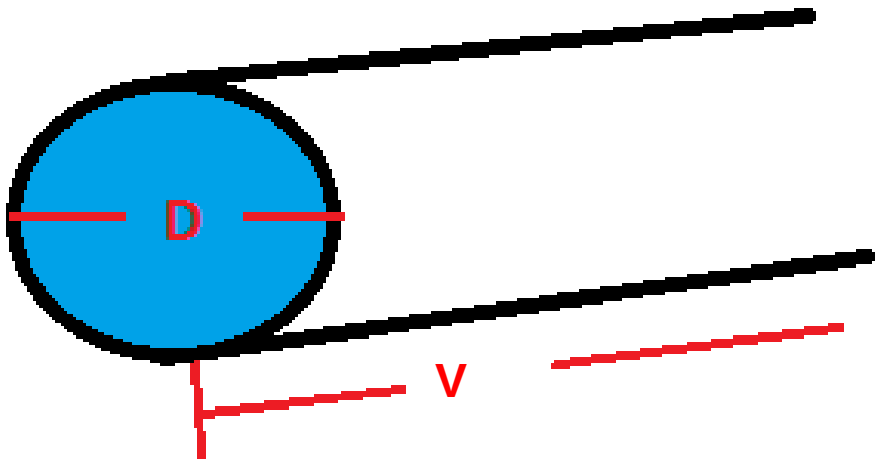
- $Q = (0.785) \times (D)^2 \times (V)$
- $Q = 0.785 \times D \times D \times V$
- 18 inches = 1.5 ft.

$0.785 \times 1.5 \text{ ft.} \times 1.5 \text{ ft.} \times 2.1 \text{ ft./sec}$

$= 3.71 \text{ ft}^3/\text{sec}$

27. A 24-inch pipe if flowing full at a velocity of 1.1 feet per second. Determine the flow rate in gallons per minute.

- Find the correct formula (Page 5)
- $Q = (0.785) \times (D)^2 \times (V)$



Number 27 Calculation

- $Q = (0.785) \times (D)^2 \times (V)$
- $Q = 0.785 \times D \times D \times V$
- 24 inches = 2 ft.

$$0.785 \times 2 \text{ ft.} \times 2 \text{ ft.} \times 1.1 \text{ ft./sec}$$

$$= 3.45 \text{ ft}^3\text{/sec}$$

$$\frac{3.45 \cancel{\text{ ft}^3\text{/sec}}}{1} \times \frac{449 \text{ gpm}}{1 \cancel{\text{ ft}^3\text{/sec}}} = 1{,}549 \text{ gpm}$$

28. Determine the detention time, in hours, for a rectangular clarifier that is 68 feet in length, 27 feet in width, and 18 feet in depth if the flow into the clarifier is 2.6 MGD.

- Find the correct formula (Page 11)

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

Number 28 Calculation

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

68 ft x 27 ft. x 18 ft. = 33,048 ft^3

$$\frac{33{,}048\ ft^3}{1} \times \frac{7.48\ gal}{1\ ft^3} = 247{,}199\ gal$$

2.6 MGD = 2,600,000 gal/day

Number 28 Calculation (cont.)

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

$$\frac{247{,}199\ \text{gal} \times 24\ \text{hr./day}}{2{,}600{,}000\ \text{gal/day}} = 2.3\ \text{hrs.}$$

29. A rectangular clarifier is 65 feet in length, 23 feet in width, and has an operating depth of 17 feet. Determine the detention time, in hours, if the flow into the clarifier is 1.1 MGD.

- Find the correct formula (Page 11)

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

Number 29 Calculation

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

$65\ \text{ft} \times 23\ \text{ft.} \times 17\ \text{ft.} = 25{,}415\ \text{ft}^3$

$$\frac{25{,}415\ \text{ft}^3}{1} \times \frac{7.48\ \text{gal}}{1\ \text{ft}^3} = 190{,}104\ \text{gal}$$

1.1 MGD = 1,100,000 gal/day

Number 29 Calculation (cont.)

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

$$\frac{190{,}104\ \text{gal} \times 24\ \text{hr./day}}{1{,}100{,}000\ \text{gal/day}} = 4.1\ \text{hrs.}$$

30. Determine the detention time in a clarifier, in hours, that has a diameter of 62 feet and a depth of 21 feet if the flow into the clarifier is 1.6 MGD.

- Find the correct formula (Page 11)

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

Number 30 Calculation

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

$0.785 \times 62\ \text{ft.} \times 62\ \text{ft.} \times 21\ \text{ft.} = 63{,}368\ \text{ft}^3$

$$\frac{63{,}368\ \text{ft}^3}{1} \times \frac{7.48\ \text{gal}}{1\ \text{ft}^3} = 473{,}993\ \text{gal}$$

1.6 MGD = 1,600,000 gal/day

Number 30 Calculation (cont.)

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

$$\frac{473{,}993\ \text{gal} \times 24\ \text{hr./day}}{1{,}600{,}000\ \text{gal/day}} = 7.1\ \text{hrs.}$$

31. Determine the detention time in a clarifier, in hours, that has a diameter of 64 feet and a depth of 18 feet if the flow into the clarifier is 1.5 MGD.

- Find the correct formula (Page 11)

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

Number 31 Calculation

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

$0.785 \times 64\ \text{ft.} \times 64\ \text{ft.} \times 18\ \text{ft.} = 57{,}876\ \text{ft}^3$

$$\frac{57{,}876\ \text{ft}^3}{1} \times \frac{7.48\ \text{gal}}{1\ \text{ft}^3} = 432{,}912\ \text{gal}$$

1.5 MGD = 1,500,000 gal/day

Number 31 Calculation (cont.)

$$DT = \frac{(V) \times (24\ \text{hr./day})}{Q}$$

$$\frac{432{,}912\ \text{gal} \times 24\ \text{hr./day}}{1{,}500{,}000\ \text{gal/day}} = 6.9\ \text{hrs.}$$

32. Determine the detention time in a pond that has a surface area of 12.6 acres, a depth of 5 feet, and an average daily flow of 0.9 MGD.

- Find the correct formula (Page 11 and Page 1)
- DT = (V)/(Q)
  - Detention time: days
  - Volume: acre-ft
  - Flow: acre-ft/day

Number 32 Calculation

DT = (V)/(Q)

12.6 acres x 5 ft. = 63 ac-ft

$$\frac{0.9\ \cancel{MGD}}{1} \times \frac{3.07\ \text{ac-ft/day}}{1\ M\cancel{G}D} = 2.6\ \text{ac-ft/day}$$

$$\frac{63\ \text{ac-ft}}{2.6\ \text{ac-ft/day}} = 24\ \text{days}$$

33. Determine the detention time in a pond that has a surface area of 18 acres, a depth of 6 feet, and an average daily flow of 0.8 MGD.

- Find the correct formula (Page 11 and Page 1)
- DT = (V)/(Q)
  - Detention time: days
  - Volume: acre-ft
  - Flow: acre-ft/day

Number 33 Calculation

$$DT = (V)/(Q)$$

18 acres x 6 ft. = 108 ac-ft

$$\frac{0.8 \cancel{MGD}}{1} \times \frac{3.07 \text{ ac-ft/day}}{1 \cancel{MGD}} = 2.5 \text{ ac-ft/day}$$

$$\frac{108 \text{ ac-ft}}{2.5 \text{ ac-ft/day}} = 43 \text{ days}$$

34. Determine the surface overflow rate on a clarifier if the diameter of the clarifier is 62 feet in diameter, the depth is 18 feet, and the average daily flow is 2.1 MGD.

- Find the correct formula (Page 10 and Page 4)
- Surface loading rate or Surface overflow rate = $\frac{\text{Flow}}{\text{A}}$

Number 34 Calculation

$$\frac{\text{Q, gpd}}{\text{Area, ft}^2}$$

$$0.785 \times 62 \text{ ft.} \times 62 \text{ ft.} = 3{,}018 \text{ ft}^2$$

$$2.1 \text{ MGD} = 2{,}100{,}000 \text{ gal/day}$$

$$\frac{2{,}100{,}000 \text{ gpd}}{3{,}018 \text{ ft}^2} = 696 \text{ gpd/ft}^2$$

35. Determine the surface overflow rate on a clarifier if the diameter of the clarifier is 62 feet in diameter, the depth is 22 feet, and the average daily flow 1.3 MGD.

- Find the correct formula (Page 10 and Page 4)
- Surface loading rate or Surface overflow rate = $\frac{\text{Flow}}{\text{A}}$

Number 35 Calculation

$$\frac{Q,\ gpd}{Area,\ ft^2}$$

$$0.785 \times 62\ ft. \times 62\ ft. = 3{,}018\ ft^2$$

$$1.3\ MGD = 1{,}300{,}000\ gal/day$$

$$\frac{1{,}300{,}000\ gpd}{3{,}018\ ft^2} = 431\ gpd/ft^2$$

36. Determine the hydraulic loading on a trickling filter if the trickling filter is 65 feet in diameter and is receiving a flow of 1.4 MGD.

- Find the correct formula (Page 10 and Page 4)
- Surface loading rate or Surface overflow rate = $\frac{\text{Flow}}{\text{A}}$

Number 36 Calculation

$$\frac{Q,\ gpd}{Area,\ ft^2}$$

$$0.785 \times 65\ ft. \times 65\ ft. = 3{,}317\ ft^2$$

$$1.4\ MGD = 1{,}400{,}000\ gal/day$$

$$\frac{1{,}400{,}000\ gpd}{3{,}317\ ft^2} = 422\ gpd/ft^2$$

37. A trickling filter that is receiving 1.8 MGD is 74 feet in diameter and the media depth is 5 feet. What is the hydraulic loading?

- Find the correct formula (Page 10 and Page 4)
- Surface loading rate or Surface overflow rate = $\frac{\text{Flow}}{\text{A}}$

Number 37 Calculation

$$\frac{Q,\ gpd}{Area,\ ft^2}$$

$0.785 \times 74\ ft. \times 74\ ft. = 4{,}299\ ft^2$

1.8 MGD = 1,800,000 gal/day

$$\frac{1{,}800{,}000\ gpd}{4{,}299\ ft^2} = 419\ gpd/ft^2$$

38. A pond receives an average daily flow of 0.9 MGD. The surface area of the pond is 64 acres. Determine the hydraulic loading on the pond in inches/day.

- Find the correct formula (Page 9)
- HLR = [(Q)/(A)] x 12 in/ft. = inches/day
- Q: acre-ft/day
- Area: acres

Number 38 Calculation

HLR = [(Q)/(A)] x 12 in/ft. = inches/day

$$\frac{0.9\ \cancel{MGD}}{1} \times \frac{3.07\ \text{ac-ft/day}}{1\ \cancel{MGD}} = 2.5\ \text{ac-ft/day}$$

[(2.5 ~~ac-ft~~/day) / (64 ~~acres~~)] x 12 in/~~ft~~.

= 0.47 in/day

39. A pond is receiving 0.8 MGD. The pond has a surface area of 16 acres and a depth of 6 feet. What is the hydraulic loading in inches/day?

- Find the correct formula (Page 9)
- HLR = [(Q)/(A)] x 12 in/ft. = inches/day
- Q: acre-ft/day
- Area: acres

Number 39 Calculation

HLR = [(Q)/(A)] x 12 in/ft. = inches/day

$$\frac{0.8\ \cancel{MGD}}{1} \times \frac{3.07\ \text{ac-ft/day}}{1\ \cancel{MGD}} = 2.5\ \text{ac-ft/day}$$

[(2.5 ~~ac-ft~~/day) / (16 ~~acres~~)] x 12 in/~~ft~~.

= 1.9 in/day

40. Determine the weir overflow rate for a clarifier that has a diameter of 62 feet and is receiving a flow of 1.9 MGD.

- Find the correct formula (Page 5)
- Overflow rate = (Q)/(L)
- Circumference = (π) x (D)

Number 40 Calculation

$$\frac{\text{Q, gpd}}{\text{Length, ft}}$$

$\pi \times 62 \text{ ft.} = 195 \text{ ft}$

1.9 MGD = 1,900,000 gal/day

$$\frac{1{,}900{,}000 \text{ gpd}}{195 \text{ ft}} = 9{,}744 \text{ gpd/ft}$$

41. The WWTP receives 2.1 MGD. The primary clarifier has a diameter of 78 feet and an operating depth of 18 feet. What is the weir overflow rate?

- Find the correct formula (Page 5)
- Overflow rate = (Q)/(L)
- Circumference = (π) x (D)

Number 41 Calculation

$$\frac{\text{Q, gpd}}{\text{Length, ft}}$$

$\pi \times 78 \text{ ft.} = 245 \text{ ft}$

2.1 MGD = 2,100,000 gal/day

$$\frac{2{,}100{,}000 \text{ gpd}}{245 \text{ ft}} = 8{,}571 \text{ gpd/ft}$$

42. Determine the population loading for a pond that receives 0.8 MGD, has a surface area of 22 acres, and serves a population of 4600 persons.

- Find the correct formula (Page 9)
- PL = (Population)/(A)

Number 42 Calculation

$$\frac{\text{Population}}{\text{Acres}}$$

$$\frac{4600 \text{ persons}}{22 \text{ acres}} = 209 \text{ persons/acres}$$

43. Determine the demand if the dosage applied to the flow is 2.8 mg/L and the residual is 1.1 mg/L.

- Find the correct formula (Page 6)
- Dose = Demand + Residual
- Dose – Residual = Demand

2.8 mg/L - 1.1 mg/L = 1.7 mg/L

44. The chlorine residual is 0.9 mg/L and the demand is 2.3 mg/L. What is the dosage that should be applied to the wastewater?

- Find the correct formula (Page 6)
- Dose = Demand + Residual

$$2.3 \text{ mg/L} + 0.9 \text{ mg/L} = 3.2 \text{ mg/L}$$

45. Determine the feed rate, in pounds per day of chlorine gas, if the flow through the plant is 1.3 MGD and the dosage to maintain the desired residual is 4.2 mg/L.

- Find the correct formula (Page 6)
- Feed rate = (d) x (Q) x (8.34 lbs./gal)

4.2 mg/L x 1.3 MGD x 8.34 lbs./gal

= 46 lbs./day

46. The dosage required to maintain the desired residual 4.1 mg/L. How many pounds per day of gaseous chlorine must be feed if the flow is 0.8 MGD?

- Find the correct formula (Page 6)
- Feed rate = (d) x (Q) x (8.34 lbs./gal)

4.1 mg/L x 0.8 MGD x 8.34 lbs./gal

= 28 lbs./day (Explain the rounding)

47. Determine the feed rate, in pounds per day, if the flow through the plant is 0.84 MGD, the required dosage is 3.4 mg/L and you are applying HTH with an availability of 65%.

- Find the correct formula (Page 6)
- Feed rate = $\frac{(d) \times (Q) \times (8.34 \text{ lbs./gal})}{\text{Chemical Purity}}$

$$\frac{3.4 \text{ mg/L} \times 0.84 \text{ MGD} \times 8.34 \text{ lbs./gal}}{0.65}$$

$$= 37 \text{ lbs./day}$$

48. A WWTP is using 5% sodium hypochlorite to disinfect the effluent. If the required dosage is 4.1 mg/L and the flow 0.5 MGD, how many pounds per day will need to be fed to the flow?

- Find the correct formula (Page 6)
- Feed rate = $\frac{(d) \times (Q) \times (8.34 \text{ lbs./gal})}{\text{Chemical Purity}}$

$$\frac{4.1 \text{ mg/L} \times 0.5 \text{ MGD} \times 8.34 \text{ lbs./gal}}{0.05}$$

$$= 342 \text{ lbs./day}$$