DW Module WDC
Volume II
Answer Key

Unit 1

Maintenance and Pumps Exercise

1. If the pump is running but not discharging, what could be causing this problem?

   a. Pump is not primed
   b. Diaphragm is ruptured
   c. Acorn nuts are too tight and are restricting the unit's operation
   d. Both a and b
   e. All of the above

2. What can cause excessive vibration in a pump?

   a. Worn bearings
   b. Worn housings
   c. Loose bolts
   d. Misalignment within the pump or between the pump and motor
   e. All of the above

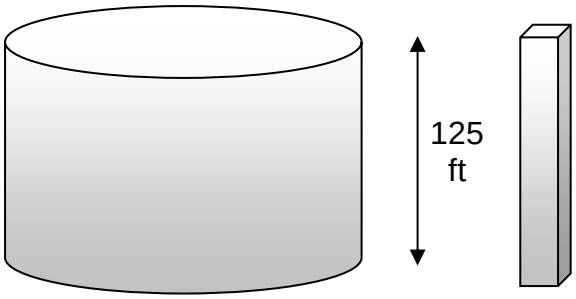
3. Ways to minimize hazards include:

   a. Using lockout/tagout procedures
   b. Replacing guards over moving parts like coupling between motors and pumps) after service
   c. Before disconnecting power lead, mark the configuration
   d. Following confined space procedures
   e. All of the above

Unit 2

Unit 2 –Distribution

Pressure is a function of the height of water. Every 2.31 feet of water exerts 1 pound of pressure at the bottom of the base of the container.



How much pressure does water exert on both tanks if they are filled to the top (psi)?

Note: pressure is not affected by the volume of the tank, only the height. Both tanks are the same height, therefore both tanks will exert the same amount of pressure on 1 square inch.

Practice Problem: The water level at the top of a fully filled water standpipe is 150 feet above the elevation of a water tap. The tank contains 50,000 gallons of water. What is the approximate pressure at the tap?

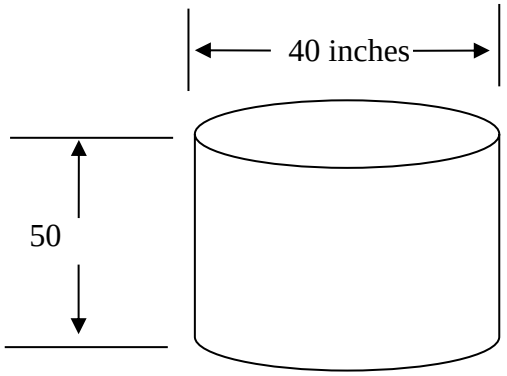
$$? \text{ psi} = \frac{1 \text{ psi}}{2.31 \text{ ft}} \times \frac{150 \text{ ft}}{} = \frac{150 \text{ psi}}{2.31 \text{ ft}} = \mathbf{64.9 \text{ psi}}$$

Note: Remember pressure is not affected by volume, only height.

Cylindrical Tank Volume Calculations

$V(ft^3) = (0.785) \times D^2 \times (d)$

Where V = Volume, cu ft (ft^3)
D = Diameter, ft
d = Depth (e.g., height), ft



Example Problem: An operator mixes a disinfectant solution. The circular mixing tank is 40 inches in diameter and 50 inches in height. If the operator needs to add about 60 gallons of water, to what depth in inches would the tank need to be filled?

Conversions Needed: 1 ft^3 = 7.48 gallons and 1 ft = 12 inches

Practice Problem: An operator mixes a disinfectant solution. The circular mixing tank is 43 inches in diameter and 55 inches in height. If the operator needs to add about 30 gallons of water, to what depth in inches would the tank need to be filled?

$V(ft^3) = (0.785) \times D^2 \times (d)$

Conversions Needed: 1 ft^3 = 7.48 gallons and 1 ft = 12 inches

Step 1: Convert 30 gallons into **ft^3** to use as "V" in equation.

? $ft^3 = \frac{1\ ft^3}{7.48\ \cancel{gal}} \times 30\ \cancel{gallons} = 4.01\ ft^3$

Step 2: Convert diameter in inches to **ft** to use as "D" in equation.

? ft = $\frac{1\ ft}{12\ inches} \times 43\ inches = 3.58\ ft$

Step 3: Square the Diameter within the **$V(ft^3) = 0.785 \times D^2 \times d$** equation

$D^2 = 3.58 \times 3.58 = 12.82\ ft^2$

Step 4: Multiply 0.785 X 12.82 (e.g., D^2 from Step 3)

$0.785 \times 12.82 = 10.07\ ft^2$

Step 5: To solve for "d", rearrange variables in the equation and insert Volume in ft^3 (from Step 1)

?d = $\frac{Volume,\ ft^3}{10.07\ ft^2\ (Step\ 4)} = \frac{4.01\ ft^3}{10.07\ ft^2} = 0.398\ ft$

Step 6: Convert depth feet into inches

? d in inches = $\frac{12\ in}{1\ \cancel{ft}} \times 0.398\ \cancel{ft} = 4.78\ inches$

Distribution Exercise

1. What is the approximate pressure (in psi) at the tap for a water tank that is 35 feet tall with a 50 foot diameter?

   ? psi = $\frac{1 \text{ psi}}{2.31 \text{ ft}}$ x $\frac{35 \text{ ft}}{}$ = $\frac{35 \text{ psi}}{2.31 \text{ ft}}$ = **15.15 psi**

2. A **corporation** stop connects the customer's service line to the water distribution main.

3. A connection between a drinking (potable) water system and an unapproved water supply is known as an illegal **cross-connection**.

4. When disinfecting water mains, what type of solution is used?

   a. Potassium permanganate
   b. Sodium hypochlorite
   c. Caustic soda
   d. Alum

5. Storage tank maintenance techniques include:

   a. Preparing for maintenance
   b. Painting to protect the steel and prevent rust
   c. Allowing paint to cure (or dry)
   d. Disinfecting the tank
   e. Collecting water samples
   f. All of the above

6. What is the unaccounted-for water loss percentage for one month if a water system:

Produced:	8,500,000 gallons
Billed:	7,400,000 gallons
Fire Protection	275,000 gallons
Flushing	100,000 gallons

   Total Accounted For = 7,400,000 + 275,000 + 100,000 = 7,775,000
   Unaccounted = Produced – Accounted – 8,500,000 - 7,775,000 = 725,000 gallons
   Percent Loss = $\frac{\text{unaccounted}}{\text{Produced}}$ x 100 = $\frac{725{,}000 \text{ gallons}}{8{,}500{,}000}$ x 100 = 8.5%

Safety Exercise

1. Electrical hazards can be controlled by:

   a. Insulation

   b. Guarding

   c. Grounding

   d. Ground-Fault Circuit Devices

   e. All of the above

2. Draw a line to match the fire class with the appropriate type of material to be extinguished.