

Module 23  
Wastewater Collection Systems  
Part I  
**Answer Key**



**Exercise for Unit 1 – Overview of Wastewater Collection Systems.**

1. List three types of collection systems and explain how they each operate.
  - a. Gravity – descriptions may vary.
  - b. Low Pressure – descriptions may vary.
  - c. Vacuum – descriptions may vary.
  
2. List six types of appurtenances used in collection systems.
  - a. manholes
  - b. backflow preventers
  - c. cleanouts
  - d. lateral
  - e. inverted siphon
  - f. flow regulators
  
3. A gravity sewer pipe or conduit is designed to carry wastewater flowing at 2 ft/sec.
  - a. True
  - b. False
  
4. Act 537 is commonly called the Sewage Facilities Planning Act.
  
5. Backflow preventers are used in a sanitary sewer lateral to prevent the accidental backflow of wastewater into buildings.
  - a. True

b. False



**Exercise for Unit 2 – Flows, Regulatory Standards, & Layout.**

1. It is important to use a peaking factor for residential flow volumes to ensure that the collection system is large enough to convey the flow.  
a. **True**      b. False
2. Flow estimates for commercial land use are generally based on **gallons per acre**. The actual values used depend on the type and size of the business occupying the land in question.
3. Determine the peak residential flow for a subdivision of 75 acres with homes on 1 acre lots and assume 3 people per home.

**(75 acres) (1 home/acre) (80 gal/person/day) (3 person/home) = 18,000 gpd**

**Peak residential flow = 18,000 x 2.5 = 45,000 gpd**

4. The minimum size of a new sanitary sewer shall be  
a. 6 inches      b. **8 inches**      c. 10 inches      d. 12 inches
5. If a sanitary sewer must cross under a water main, there must be at least 18 inches of vertical clearance.  
a. **True**  
b. False
6. Which of the following statements are true?  
a. An Erosion and Sedimentation (E&S) control plan is needed for earth moving activity.  
b. Sanitary sewers should be 10 feet horizontally from existing or proposed water mains.  
c. The slope of a sanitary sewer is often called Rise/Run.  
d. **All of the above.**
7. The minimum depth of a sanitary sewer is **4** feet.
8. The invert elevation at manhole one is 263.47 feet and the invert elevation for manhole two is 271.94 feet. The pipe length between the two is 400 feet. What is the slope of the sanitary sewer?  
 **$\frac{271.94 - 263.47}{400} = \frac{8.47}{400} = 0.021$**
9. Sanitary sewers are often constructed to run in the middle of streets to provide easy access and manholes are typically placed about every **400** feet.



## Exercise for Unit 2 – Installation, Construction Inspection & Testing.

1. The two major types of pipes used in collection systems today are **rigid** pipe and **flexible** pipe.
2. Pipe **deflection** is when the pipe has changed direction, either up, down, right or left from the direction it was originally laid.
3. When using rigid pipe, which class of bedding is typically not permissible?
  - a. Class A
  - b. Class B
  - c. Class C
  - d. **Class D**
4. An 8-inch diameter Vitrified Clay Pipe (VCP) has a standard strength of 2,000 pounds per foot and is laid in a Class B trench. What is the total supporting strength?

$$(2000 \text{ lb/ft}) \times (1.9) = 3800 \text{ lb/ft}$$

5. The contract drawings provide a **graphical** representation of the work to be done.
6. The qualitative requirements for a project covering topics like the material and workmanship involved in the manufacturing and installation of equipment can be found in the:
  - a. Legend
  - b. Index
  - c. **Specifications**
  - d. PA One Call
7. Name the two types of reports that an inspector would normally write to keep track of progress and problems at a work site.
  - a. **Daily reports**
  - b. **monthly reports**
8. Liquid leaking out of a collection pipe is called **exfiltration**.
9. Liquid leaking into a collection pipe from the surrounding bedding material is called **infiltration**.
10. A deflection test gage ball or mandrel cannot be pulled through a sewer pipe if the pipe is deflected more than five percent of the pipe diameter.
  - a. **True**
  - b. False





## Exercise

1. List the three types of collection system cleaning methods.
  - a. chemical
  - b. hydraulic
  - c. mechanical
2. What are the three methods of mechanical cleaning?
  - a. power buckets
  - b. power rodders
  - c. hand rods
3. List three of the six types of hydraulic cleaning and explain when each method is appropriate for use.
  - a. balling – grit and grease removal
  - b. high velocity cleaners – loose debris removal
  - c. flushing – floatable solids removal or sewer scooter, kites, bags, and poly pigs.
4. List three rehabilitation methods.
  - a. excavates and replace
  - b. chemical grouting
  - c. sliplining, or cured-in-place, deformed and re-shaped, and pipe bursting
5. Smoke testing can be useful in detecting:
  - a. illegal sump pump connections
  - b. cracks in sewer piping
  - c. storm sewers connected to sanitary sewers
  - d. all the above
6. Lamping can be used to determine if a sewer is not straight or blocked.
  - a. True
  - b. False
7. Grouting is an excellent way to repair the structural integrity of a deteriorated manhole.
  - a. True
  - b. False