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Onsite 202 Answer Key

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We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your manual and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular. Multiple Choice Section, One answer per question and please use the answer key.**

Chapter 1- Onsite Sewage System Facilities Review

1. Onsite/Decentralized Wastewater Treatment Systems

Onsite sewage facilities (OSSF) or Subsurface Wastewater Infiltration facilities (SWIF) are septic systems designed _____ on the same property that produces the wastewater.

- A. Disposing liquid household waste
- B. Of effluent on the same property
- C. Individual onsite septic systems
- D. Sanitary sewers carry wastewater
- E. To treat and dispose of effluent
- F. None of the Above

2. Onsite/decentralized wastewater treatment systems are often called septic systems. These septic systems treat sewage from homes and businesses that are not connected to?

- A. The soil absorption system
- B. A septic tank
- C. The leach field
- D. A centralized wastewater treatment plant
- E. Pressure distribution system(s)
- F. None of the Above

3. Decentralized treatment systems often include the following: individual onsite septic systems, cluster systems, large septic systems and alternative wastewater treatment technologies like constructed wetlands, recirculating sand filters, mound systems, and?

- A. Ozone disinfection systems
- B. Of effluent on the same property
- C. Individual onsite septic systems
- D. Sanitary sewers carry wastewater
- E. A septic tank or grease interceptor tank
- F. None of the Above

Sewerage System Types

4. Which of the following terms are generally broken out into three different categories: sanitary sewers, storm sewers, and combined sewers?

- A. Storm sewer(s)
- B. Centralized sewer systems
- C. The entire drainfield
- D. Decentralized sewer systems
- E. Combined sewers
- F. None of the Above

5. Sanitary sewers pipe wastewater or sewage from homes and businesses to treatment plants. Underground sanitary sewer pipes can clog or break, causing unintentional "overflows" of raw sewage that flood?

- A. Basements and streets
- B. Of effluent on the same property
- C. Individual onsite septic systems
- D. Sanitary sewers carry wastewater
- E. A septic tank or grease interceptor tank
- F. None of the Above

6. Which of the following terms are designed to quickly get rainwater off the streets during rain events?

- A. Storm sewer(s)
- B. A storage area
- C. The entire drainfield
- D. Sanitary sewers, storm sewers, and combined sewers
- E. A septic tank or grease interceptor tank
- F. None of the Above

7. Which of the following terms carry both wastewater and storm water in the same pipe?

- A. Storm sewer(s)
- B. Centralized sewer systems
- C. The entire drainfield
- D. Decentralized sewer systems
- E. Combined sewers
- F. None of the Above

Basic Onsite Treatment Process

8. Physical onsite treatment processes involving capturing of solids and fats/oils/grease in an enclosed vessel, typically by settling and flotation, such as provided in a septic tank or grease interceptor tank. This process also includes trapping of solids via septic tank effluent filters or screens prior to?

- A. Storm sewer(s)
- B. A storage area
- C. The entire drainfield
- D. Discharge of the tank effluent
- E. A septic tank or grease interceptor tank
- F. None of the Above

9. Biological and chemical processes are designed to remove organic matter, mostly through digestion and decomposition, often aided by introduction of?

- A. Or exposure to atmospheric oxygen
- B. Secondary effluent
- C. Process of decomposition
- D. Nutrients and organic matter
- E. Final treatment of the effluent
- F. None of the Above

10. A typical standard for _____ is biochemical oxygen demand (BOD) and total suspended solids (TSS) concentrations less than or equal to 20 mg/L each on a 30-day average basis.

- A. Acid forming bacteria
- B. BOD removal efficiency
- C. Colloidal particles
- D. Notable exception of nitrogen (N)
- E. Secondary effluent
- F. None of the Above

Septic System Basics Described

11. The septic system is a natural process of treating and disposing liquid household waste. The first component of all septic systems is the tank. Most tanks are split into two compartments and have pipe baffles and an outlet filter to ensure?

- A. The soil absorption system
- B. A septic tank
- C. The solids stay in the tank
- D. The soil absorption system
- E. Pressure distribution system(s)
- F. None of the Above

12. The biologic process initiates in the tank where the effluent separates into layers and begins?

- A. The water phase
- B. Secondary effluent
- C. The process of decomposition
- D. Nutrients and organic matter
- E. Final treatment of the effluent
- F. None of the Above

13. Bacteria are naturally present in all septic systems and begin to digest the solids that have settled to the bottom of the tank, transforming a large percentage of these solids into?

- A. Acid forming bacteria
- B. Liquids and gases
- C. Colloidal particles
- D. Notable exception of nitrogen (N)
- E. The retention capacity of the soil
- F. None of the Above

14. Which of the following terms within the tank climb to the level of the outflow pipe, they enter the next part of the treatment system?

- A. The water phase
- B. Secondary effluent
- C. Liquids
- D. Nutrients and organic matter
- E. Final treatment of the effluent
- F. None of the Above

15. Which of the following terms always happens in the soil where additional microbes break down the waste and the “clean” water is put back into the ground thereby recharging the aquifers?

- A. Acid forming bacteria
- B. BOD removal efficiency
- C. Final treatment of the effluent
- D. Notable exception of nitrogen (N)
- E. The retention capacity of the soil
- F. None of the Above

16. Wastewater contains several undesirable pollutants. Pathogens such as viruses or bacteria can enter drinking water supplies creating_____.

- A. The water phase
- B. Secondary effluent
- C. Process of decomposition
- D. Nutrients and organic matter
- E. A potential health hazard
- F. None of the Above

17. Which of the following terms entering waterways can lead to incredible growth in the quantity of aquatic microorganisms?

- A. Acid forming bacteria
- B. Nutrients and organic matter
- C. Colloidal particles
- D. Notable exception of nitrogen (N)
- E. The retention capacity of the soil
- F. None of the Above

18. Which of the following terms can decrease oxygen levels in the water causing aquatic life to suffocate?

- A. Metabolic activity of microbes
- B. Secondary effluent
- C. Process of decomposition
- D. Nutrients and organic matter
- E. Final treatment of the effluent
- F. None of the Above

19. Which of the following terms lets the separated water to drain out of the system and to absorb into the leach field?

- A. The soil absorption system
- B. A septic tank
- C. A drain field
- D. The soil absorption system
- E. Pressure distribution system(s)
- F. None of the Above

20. Soil is _____ for the effluent water to be treated, microorganisms in the soil will treat the drain water before it percolates out of the system.

- A. The soil absorption system
- B. A septic tank
- C. The leach field
- D. The soil absorption system
- E. The final treatment area
- F. None of the Above

21. Which of the following terms separates the solids from the liquids, and serves a storage area for the solids to decompose and if properly maintained will decompose the solids faster than they build up?

- A. Storm sewer(s)
- B. A storage area
- C. The entire drainfield
- D. Sanitary sewers, storm sewers, and combined sewers
- E. A septic tank
- F. None of the Above

22. If installed properly, _____ is environmentally safe, long lasting and almost maintenance free. This is why septic system design is so important.

- A. Storm sewer(s)
- B. A storage area
- C. The entire drainfield
- D. The conventional system
- E. A septic tank or grease interceptor tank
- F. None of the Above

23. Which of the following terms are usually required when there is less than optimal soil depth available for complete treatment of the effluent by a gravity system?

- A. The soil absorption system
- B. A septic tank
- C. The leach field
- D. The soil absorption system
- E. Pressure distribution system(s)
- F. None of the Above

24. A pump is used to pressurize the effluent into a small underground pvc pipe which transports it to _____.

- A. Storm sewer(s)
- B. A storage area
- C. The drainfield
- D. Sanitary sewers, storm sewers, and combined sewers
- E. A septic tank or grease interceptor tank
- F. None of the Above

Conventional Septic Systems

25. Conventional treatment systems are the most commonly used wastewater treatment technologies, combining _____.

- A. Storm sewer(s)
- B. Primary and secondary treatment
- C. The entire drainfield
- D. Sewers
- E. A septic tank or grease interceptor tank
- F. None of the Above

26. Which of the following terms facilitates aerobic treatment and filtration of the remaining contaminants?

- A. The soil absorption system
- B. A septic tank
- C. The leach field
- D. The soil absorption system
- E. Pressure distribution system(s)
- F. None of the Above

27. Subsurface discharge of effluent to the soil can be configured to optimize treatment via pressurized time-dosing of preset volumes of treated wastewater, which facilitates oxygenation of the soil matrix between doses, promotes film flow of wastewater over soil particles, and ensures a uniform and consistent application of _____.

- A. Disposing liquid household waste
- B. Effluent on the same property
- C. Effluent to the entire drainfield
- D. Sanitary sewers carry wastewater
- E. A septic tank or grease interceptor tank
- F. None of the Above

Septic Treatment

28. The solids removed are stored in _____, where they undergo liquefaction.
- A. The water phase
 - B. Secondary effluent
 - C. Sludge and scum layers
 - D. Nutrients and organic matter
 - E. Final treatment of the effluent
 - F. None of the Above
29. During liquefaction, the first step in the digestion process, acid forming bacteria partially digest the solids by hydrolyzing the proteins and converting them to volatile fatty acids, most of which are dissolved in _____.
- A. The digestion process
 - B. The amount of BOD
 - C. Colloidal and dissolved solids
 - D. Septic tanks (SWISs)
 - E. The water phase
 - F. None of the Above
30. The volatile fatty acids still exert much of _____ demand that was originally in the organic suspended solids.
- A. The water phase
 - B. Secondary effluent
 - C. Process of decomposition
 - D. Nutrients and organic matter
 - E. The biochemical oxygen
 - F. None of the Above
31. Because acids are in the dissolved form, they are able to pass from the tank in the effluent stream, reducing the _____ of septic tanks compared to primary sedimentation.
- A. Acid forming bacteria
 - B. BOD removal efficiency
 - C. Colloidal particles
 - D. Notable exception of nitrogen (N)
 - E. The retention capacity of the soil
 - F. None of the Above
32. Complete digestion, in which _____ are converted to methane, could reduce the amount of BOD released by the tank, but it usually does not occur to a significant extent because wastewater temperatures in septic tanks are typically well below the optimum temperature for methane producing bacteria.
- A. The digestion process
 - B. The amount of BOD
 - C. Colloidal and dissolved solids
 - D. Septic tanks (SWISs)
 - E. The volatile fatty acids
 - F. None of the Above
33. Gases that form from the microbial action in the tank rise in the wastewater column. The rising gas bubbles disturb the quiescent wastewater column, which can reduce the settling efficiency of the tank. They also dislodge _____ in the sludge blanket so they can escape in the water column.
- A. Acid forming bacteria
 - B. BOD removal efficiency
 - C. Colloidal particles
 - D. Notable exception of nitrogen (N)
 - E. The retention capacity of the soil
 - F. None of the Above
34. Which of the following terms varies naturally in quality depending on the characteristics of the wastewater and condition of the tank?
- A. Acid forming bacteria
 - B. BOD removal efficiency
 - C. Colloidal particles
 - D. Septic tank effluent
 - E. The retention capacity of the soil
 - F. None of the Above

Typical SWIS Performance

35. Results from numerous studies have shown that septic tanks (SWISs) achieve high removal rates of many pollutants of concerns with _____.

- A. The digestion process
- B. The amount of BOD
- C. Colloidal and dissolved solids
- D. The notable exception of nitrogen (N)
- E. Phosphorous and metals
- F. None of the Above

36. Biochemical oxygen demand (BOD), suspended solids, _____are effectively removed within 2-5 feet of unsaturated , aerobic soil.

- A. Septic tank effluent
- B. Excess nutrients
- C. Final bacteria breakdown
- D. Organic material and total suspended solids (TSS)
- E. Fecal bacteria indicators and surfactants
- F. None of the Above

37. Which of the following terms are removed by adsorption, ion exchange and precipitation?

- A. The digestion process
- B. The amount of BOD
- C. Colloidal and dissolved solids
- D. Septic tanks (SWISs)
- E. Phosphorous and metals
- F. None of the Above

38. The retention capacity of the soil is finite and will vary with different types of soil mineralogy, pH, Redox potential and _____.

- A. Acid forming bacteria
- B. BOD removal efficiency
- C. Colloidal particles
- D. Cation exchange capacity
- E. The retention capacity of the soil
- F. None of the Above

39. Field and laboratory studies suggest that the soil is quite effective in removing _____, but some types of viruses apparently are able to leach from SWISs to the groundwater.

- A. Viruses
- B. Secondary effluent
- C. Process of decomposition
- D. Nutrients and organic matter
- E. Destruction of viruses and toxic organics
- F. None of the Above

40. Fine textured soils, low hydraulic loadings, aerobic subsoils and high temperatures favor _____.

- A. Viruses
- B. Secondary effluent
- C. Nitrates
- D. Nutrients and organic matter
- E. Destruction of viruses and toxic organics
- F. None of the Above

41. The most significant documented threat to our groundwater supply from SWISs are _____.

- A. Viruses
- B. Secondary effluent
- C. Nitrates
- D. Nutrients and organic matter
- E. Destruction of viruses and toxic organics
- F. None of the Above

Designs and Configurations

42. Subsurface wastewater infiltration systems (SWISs) are the most commonly used systems for _____ of onsite wastewater.

- A. The digestion process
- B. The amount of BOD
- C. Colloidal and dissolved solids
- D. The treatment and dispersal
- E. Phosphorous and metals
- F. None of the Above

43. Infiltrative surfaces are located in permeable, unsaturated natural soil or imported fill material so wastewater can infiltrate and percolate through the _____.

- A. Typically gravel or crushed rock
- B. Soil infiltrative surfaces
- C. Fine textured soil(s)
- D. Backfill material into the porous medium
- E. Underlying soil to the ground water
- F. None of the Above

44. As the wastewater infiltrates and percolates through the soil, it is treated through a variety of physical, chemical, and _____.

- A. The digestion process
- B. The amount of BOD
- C. Colloidal and dissolved solids
- D. Biochemical processes and reactions
- E. Phosphorous and metals
- F. None of the Above

45. Many different designs and configurations are used, but all incorporate soil infiltrative surfaces that are located in _____.

- A. Typically gravel or crushed rock
- B. Soil infiltrative surfaces
- C. Fine textured soil(s)
- D. The porous medium
- E. Buried excavations
- F. None of the Above

46. The primary infiltrative surface is the bottom of the excavation, but the sidewalls also may be used for _____.

- A. Infiltration
- B. Effluent
- C. Trickle
- D. Simple activated sludge variations
- E. An oxygen rich environment
- F. None of the Above

47. Perforated pipe is installed to distribute the wastewater over _____.

- A. The water phase
- B. Secondary effluent
- C. The infiltration surface
- D. Nutrients and organic matter
- E. Final treatment of the effluent
- F. None of the Above

48. A porous medium, typically gravel or crushed rock, is placed in the excavation below and around the distribution piping to support the pipe and spread _____ from the distribution pipes across the excavation cavity.

- A. The digestion process
- B. The amount of BOD
- C. Colloidal and dissolved solids
- D. The localized flow
- E. Phosphorous and metals
- F. None of the Above

Gravelless System

49. Other gravelless or "aggregate-free" system components may be substituted. The porous medium maintains the structure of the excavation, exposes the applied wastewater to more infiltrative surface, and provides storage space for the wastewater within _____ during peak flows with gravity systems.

- A. Natural soil
- B. Its void fractions
- C. The primary infiltrative surface
- D. Carbonaceous material in the wastewater
- E. Fine textured soils
- F. None of the Above

50. A permeable geotextile fabric or other suitable material is laid over the porous medium before the excavation is backfilled to prevent the introduction of _____.

- A. The digestion process
- B. The amount of BOD
- C. Colloidal and dissolved solids
- D. Backfill material into the porous medium
- E. Phosphorous and metals
- F. None of the Above

51. Which of the following terms is typically used for backfilling, and the surface of the backfill is usually slightly mounded and seeded with grass?

- A. The soil absorption system
- B. A septic tank
- C. The leach field
- D. Natural soil
- E. Pressure distribution system(s)
- F. None of the Above

52. Subsurface wastewater infiltration systems provide both _____ of the applied wastewater. Wastewater is transported from the infiltration system through three zones.

- A. The digestion process
- B. The amount of BOD
- C. Colloidal and dissolved solids
- D. Dispersal and treatment
- E. Pressure distribution system(s)
- F. None of the Above

53. Two of these zones, the infiltration zone and vadose zone, act as fixed-film bioreactors. The infiltration zone, which is only a few centimeters thick, is the most biologically active zone and is often referred to as the _____.

- A. Natural soil
- B. Void fractions
- C. The primary infiltrative surface
- D. Carbonaceous material in the wastewater
- E. Biomat
- F. None of the Above

54. Carbonaceous material in the wastewater is quickly degraded in the infiltration zone, and nitrification occurs immediately below this zone if sufficient _____ is present. Free or combined forms of oxygen in the soil must satisfy the oxygen demand generated by the microorganisms degrading the materials.

- A. Effluent BOD
- B. TSS and organic material
- C. Excess nutrients
- D. Oxygen and water
- E. Oxygen
- F. None of the Above

55. If sufficient oxygen is not present, the metabolic processes of the microorganisms can be reduced or halted and both _____ of the wastewater will be adversely affected.

- A. The water phase
- B. Secondary effluent
- C. Process of decomposition
- D. Nutrients and organic matter
- E. Treatment and infiltration
- F. None of the Above

56. Which of the following terms provides a significant pathway for oxygen diffusion to re-aerate the infiltration zone?

- A. The soil absorption system
- B. A septic tank
- C. The leach field
- D. The vadose (unsaturated) zone
- E. Pressure distribution system(s)
- F. None of the Above

57. In addition, it is the infiltration zone where most sorption reactions occur because the negative moisture potential in the unsaturated zone causes _____ into the finer pores of the soil, resulting in greater contact with the soil surfaces.

- A. The soil absorption system
- B. Suitable Soil
- C. Media Bio-filters
- D. Percolating water to flow
- E. Drip Irrigation Systems
- F. None of the Above

Mound Systems

58. Mound systems are appropriate for areas with _____. After treatment through the sand, the effluent percolates directly into the soil under the mound.

- A. The soil absorption system
- B. A septic tank
- C. The leach field
- D. A high water table or shallow, fractured bedrock
- E. Pressure distribution system(s)
- F. None of the Above

59. Which of the following terms feature effluent dispersal piping placed at natural grade, with the mound consisting mostly of cover soil for the piping? The mound should have inspection ports, so wastewater distribution across the infiltration area can be monitored.

- A. Storm sewer(s)
- B. A storage area
- C. The entire drainfield
- D. At-grade systems
- E. A septic tank or grease interceptor tank
- F. None of the Above

Aerobic Treatment Units

60. Aerobic treatment units (ATUs) consist of prefabricated units featuring consecutive or compartmentalized tanks, pumps, blowers, and _____, and are designed to treat wastewater via suspended or attached growth decomposition in an oxygen rich environment.

- A. Internal piping
- B. Buffer
- C. Septic effluent
- D. Sequencing batch reactors, trickling filters
- E. Attached growth decomposition
- F. None of the Above

61. When oxygen is supplied, the rate of microbial activity and related treatment processes accelerates. Three processes are involved in most aerobic systems: physical separation (mostly settling), aerobic treatment (aeration and mixing), and _____.

- A. Buffering
- B. Effluent
- C. Clarification (final settling)
- D. Simple activated sludge variations
- E. An oxygen rich environment
- F. None of the Above

62. ATUs vary in design and can consist of simple activated sludge variations, sequencing batch reactors, _____, and combinations of two or more of these unit processes.

- A. Uncontrolled
- B. Buffer
- C. Septic effluent
- D. Trickling filters
- E. Attached growth decomposition
- F. None of the Above

Media Filters

63. Septic tank effluent can be applied to a layer of sand or gravel, a tank containing peat or plastic media, or compartments of hanging textile or other material to improve oxygen access and enhance biochemical treatment processes. A number of these so-called " _____ " are available to treat wastewater.

- A. Media filters
- B. Effluent filters
- C. Ticklers
- D. Simple activated sludge variations
- E. Oxygen rich environment
- F. None of the Above

64. In single-pass or intermittent filter (ISF) design, _____ is pump-dosed uniformly onto the media at regular intervals 12 to 48 times per day.

- A. Buffer
- B. Effluent
- C. Trickle
- D. Simple activated sludge
- E. Septic tank effluent
- F. None of the Above

65. As the effluent trickles through the media, _____ are filtered, and bacteria growing on the media aerobically treat organic wastewater.
- A. Uncontrolled
 - B. Microorganisms
 - C. Septic effluent
 - D. Suspended and some colloidal particles
 - E. Attached growth decomposition
 - F. None of the Above

Pressure and Drip Soil Dispersal System Operation and Inspection

66. The purpose of septic effluent "dosing" systems is to place septic effluent in the _____ or drainfield at intervals rather than continuously.
- A. Buffer
 - B. Effluent
 - C. Absorption system
 - D. Simple activated sludge variations
 - E. Microorganisms
 - F. None of the Above

67. In effect, the _____ forms a "buffer" which receives and stores septic effluent flowing (or being pumped) out of the septic tank until a desired dosing quantity is reached.
- A. Effluent dosing chamber
 - B. Buffer
 - C. Septic effluent
 - D. Sequencing batch reactors, trickling filters
 - E. Attached growth decomposition
 - F. None of the Above

68. Wastewater effluent is distributed for final treatment over time either by _____.
- A. Simple activated sludge
 - B. Effluent
 - C. Trickle
 - D. Uncontrolled, or controlled methods
 - E. An oxygen rich environment
 - F. None of the Above

Uncontrolled Septic Effluent Flow

69. A conventional gravity septic system and drainfield is "uncontrolled". When waste enters the septic tank, it forces the same volume of effluent out of the tank and into the leach field. Some experts call this _____.
- A. Uncontrolled
 - B. A continuous or trickling septic system
 - C. Septic effluent
 - D. Sequencing batch reactors, trickling filters
 - E. Attached growth decomposition
 - F. None of the Above

70. The timing of effluent movement or "trickle" into the absorption field is based simply on when people are using the building plumbing and thus based simply on when wastewater flows out of the building into _____.
- A. The buffer
 - B. The effluent
 - C. The trickle
 - D. The septic tank
 - E. An oxygen rich environment
 - F. None of the Above

Controlled Septic Effluent Flow

71. Pressure-dosed Drainfield Septic Systems use a separate effluent pumping chamber and an effluent pump. The effluent pumping station is located downstream from the septic tank and is used to move _____ into a pressure-fed network of distribution pipes.
- A. Uncontrolled
 - B. Buffer
 - C. Septic effluent
 - D. Sequencing batch reactors, trickling filters
 - E. Attached growth decomposition
 - F. None of the Above

72. Which of the following terms is used in a variety of disposal field designs including mounds and sand beds, and have the advantage of being able to distribute effluent uniformly throughout the absorption system, and the disadvantage of added system cost and complexity, along with the requirement for electricity for system operation?

- A. Pressure dosing
- B. Buffer
- C. Septic effluent
- D. Sequencing batch reactors, trickling filters
- E. Attached growth decomposition
- F. None of the Above

Advanced Onsite Wastewater Treatment Systems and Components -Identify the Term

73. A subsurface soil dispersal system that distributes treated wastewater through drip irrigations lines.

- A. Drip Irrigation Systems
- B. Sand Filters
- C. Microorganisms
- D. Low-pressure Distribution Systems
- E. Constructed Wetlands
- F. None of the Above

74. Six to 12 inches deep in natural soil and other engineered distribution systems using fill soil material.

- A. Sand Mounds
- B. Suitable Soil
- C. Media Bio-filters
- D. Modified Shallow Placed Gravity Lateral Trenches
- E. Drip Irrigation Systems
- F. None of the Above

75. A packed-bed filter of sand or other granular materials used to provide advanced secondary treatment of septic tank effluent.

- A. Drip Irrigation Systems
- B. Sand Filters
- C. Microorganisms
- D. Low-pressure Distribution Systems
- E. Constructed Wetlands
- F. None of the Above

76. Packed-bed filters using other more porous materials, (e.g., peat, textile, or foam) to provide advanced secondary treatment of septic tank effluent.

- A. Sand Mounds
- B. Suitable Soil
- C. Media Bio-filters
- D. Modified Shallow Placed Gravity Lateral Trenches
- E. Drip Irrigation Systems
- F. None of the Above

77. An OWTS in which pressurized small diameter distribution lines are used for equal distribution of effluent within the final treatment and dispersal component.

- A. Drip Irrigation Systems
- B. Sand Filters
- C. Microorganisms
- D. Low-pressure Distribution Systems
- E. Constructed Wetlands
- F. None of the Above

78. This device consist of a lined (e.g., impervious PVC liner on sand bedding) excavation or structure filled with uniform washed sand that is placed over an under-drain system.

- A. Drip Irrigation Systems
- B. Sand Filter
- C. Microorganisms
- D. Low-pressure Distribution Systems
- E. Constructed Wetlands
- F. None of the Above

79. This term is an effective treatment medium for sewage tank effluent because it contains a complex biological community.

- A. Sand Mounds
- B. Suitable Soil
- C. Media Bio-filters
- D. Modified Shallow Placed Gravity Lateral Trenches
- E. Drip Irrigation Systems
- F. None of the Above

80. An OWTS that incorporates an aquatic treatment system consisting of one or more lined basins which may be filled with a medium and where wastewater undergoes some combination of physical, chemical, and/or biological treatment and evapotranspiration.

- A. Drip Irrigation Systems
- B. Sand Filters
- C. Microorganisms
- D. Low-pressure Distribution Systems
- E. Constructed Wetlands
- F. None of the Above

81. An above ground treatment system that incorporates at least 12 inches of clean sand above the original soil surface and disperses the treated wastewater into the original soil.

- A. Sand Mounds
- B. Suitable Soil
- C. Media Bio-filters
- D. Modified Shallow Placed Gravity Lateral Trenches
- E. Drip Irrigation Systems
- F. None of the Above

Fill-in-the Blank

82. Which of the following terms treat wastewater physically, chemically, and biologically before it reaches the groundwater, preventing pollution and public health hazards?

- A. Effluent BOD
- B. TSS and organic material
- C. Microorganisms in soil
- D. Oxygen and water
- E. Pollution and public health hazards
- F. None of the Above

83. Under some soil conditions, _____ may not accept the wastewater or may fail to properly treat the wastewater unless special modifications to system design are made.

- A. Septic tank effluent
- B. Excess nutrients
- C. Final bacteria breakdown
- D. Organic material and total suspended solids (TSS)
- E. Subsurface absorption systems
- F. None of the Above

84. Public health is a major concern because domestic wastewaters contain many substances that are undesirable and potentially harmful, such as pathogenic bacteria, infectious viruses, organic matter, toxic chemicals, pharmaceutical drugs, and _____.

- A. Effluent BOD
- B. TSS and organic material
- C. Excess nutrients
- D. Oxygen and water
- E. Pollution and public health hazards
- F. None of the Above

85. To protect the public as well as the environment, wastewater must be treated in a safe and effective manner. The first component in an individual sewage treatment system is usually a septic tank, which removes some organic material and _____.

- A. Septic tank effluent
- B. Excess nutrients
- C. Final bacteria breakdown
- D. Total suspended solids (TSS)
- E. Subsurface absorption systems
- F. None of the Above

86. Which of the following terms' removal is very important because it prevents excessive clogging of the soil infiltrative surface?

- A. Effluent BOD
- B. TSS and organic material
- C. Excess nutrients
- D. Oxygen and water
- E. Pollution and public health hazards
- F. None of the Above

Suitably-textured Soil

87. Suitably-textured soil must be deep enough to allow _____ and treatment of the effluent before it is released into the natural environment. Usually this release is into groundwater. It has been determined that three feet of aerated soil will provide sufficient treatment of septic tank effluent.

- A. Septic tank effluent
- B. Excess nutrients
- C. Final bacteria breakdown
- D. Organic material and total suspended solids (TSS)
- E. Adequate filtration
- F. None of the Above

88. A three-foot separation distance is required from the bottom of the dispersal media to a limiting soil condition such as groundwater or bedrock. This three-foot treatment zone provides sufficient detention time for final bacteria breakdown and sufficient distance for the filtration that is essential for the safe treatment of _____.

- A. Effluent BOD
- B. TSS and organic material
- C. Excess nutrients
- D. Oxygen and water
- E. Pollution and public health hazards
- F. None of the Above

Chapter 2- Onsite Operation and Maintenance (O&M)

Operation, Maintenance, and Monitoring

89. Subsurface wastewater infiltration systems require _____. However, more complex pretreatment, larger and more variable flows, and higher-risk installations increase the need for maintenance and monitoring.

- A. Little operator intervention
- B. The operation and maintenance
- C. The absorption field
- D. A subsurface dispersal system
- E. The original system
- F. None of the Above

Failures and Contingencies

90. To avoid threats to public health and the environment during periods when a system malfunctions hydraulically, contingency plans should be made to permit continued use of the system until _____ can be taken.

- A. Removing pollutants from wastewater
- B. Pumping needs
- C. Appropriate remedial actions
- D. Collect, treat, and disperse wastewater
- E. System malfunctions hydraulically
- F. None of the Above

Individual Wastewater Systems

91. Individual systems generally consist of one or more treatment and _____.

- A. The restrictive horizon
- B. The operation and maintenance
- C. The absorption field
- D. A subsurface dispersal system
- E. The original system
- F. None of the Above

92. Which of the following terms of an individual system can vary greatly depending on the type of system?

- A. Removing pollutants from wastewater
- B. Pumping needs
- C. Conventional systems
- D. Collect, treat, and disperse wastewater
- E. The operation and maintenance requirements
- F. None of the Above

93. Mechanical systems, such as _____, require servicing three to four times a year, while conventional systems need service or pumping every three to seven years, depending on occupancy and use.
- | | |
|----------------------------------|----------------------------------|
| A. Activated sludge-based units | D. A subsurface dispersal system |
| B. The operation and maintenance | E. The original system |
| C. The absorption field | F. None of the Above |

Conventional Systems

94. Conventional "septic" systems are the most widely used wastewater treatment system. These systems are simple to operate and, when properly designed, constructed, and maintained, do an excellent job of _____.
- | | |
|--|--|
| A. Removing pollutants from wastewater | D. Collect, treat, and disperse wastewater |
| B. Pumping needs | E. System malfunctions hydraulically |
| C. Conventional systems | F. None of the Above |

95. Which of the following terms require periodic pumping to remove the solids, fats, oils, and grease that accumulate in the septic tank?
- | | |
|--|--|
| A. Removing pollutants from wastewater | D. Collect, treat, and disperse wastewater |
| B. Pumping needs | E. System malfunctions hydraulically |
| C. Conventional systems | F. None of the Above |

96. When a system is poorly maintained and not pumped out on a regular basis, sludge can build up inside the tank and may ultimately clog _____, making the system unusable.
- | | |
|----------------------------------|----------------------------------|
| A. The restrictive horizon | D. A subsurface dispersal system |
| B. The operation and maintenance | E. The original system |
| C. The absorption field | F. None of the Above |

97. Most conventional system designs now include risers that allow access to inspect tanks and determine _____.
- | | |
|----------------------------------|------------------------|
| A. The restrictive horizon | D. Pumping needs |
| B. The operation and maintenance | E. The original system |
| C. The absorption field | F. None of the Above |

Perforated Pipe

98. Perforated pipe is laid in _____ excavated into the restrictive horizon. A durable, porous medium is placed around the piping and up to a level above the estimated seasonally high saturated zone.
- | | |
|----------------------------------|-----------------------------------|
| A. The restrictive horizon | D. The bottom of upslope trenches |
| B. The operation and maintenance | E. The original system |
| C. The absorption field | F. None of the Above |

99. The porous medium intercepts the ground water and conveys it to the drainage pipe. To provide an outfall for the drain, one or both ends of the pipe are extended downslope to a point where it intercepts _____.
- | | |
|----------------------------------|-----------------------|
| A. The design of a curtain drain | D. The ground surface |
| B. The end of the SWIS | E. The drainage pipe |
| C. The bottom of the SWIS | F. None of the Above |

100. The drain should avoid capture of _____ and ground water infiltrating from below the SWIS or near the end of the drain.

- A. The design of a curtain drain
- B. The end of the SWIS
- C. The bottom of the SWIS
- D. The SWIS percolate plume
- E. The drainage pipe
- F. None of the Above

101. A separation distance between the SWIS and _____ that is sufficient to prevent percolate from the SWIS from entering the drain should be maintained.

- A. The permeability decreases
- B. The drain
- C. The porous medium
- D. The saturated hydraulic conductivity
- E. The drainable porosity
- F. None of the Above

102. The vertical distance between _____ and the drain and soil permeability characteristics should determine this distance.

- A. The design of a curtain drain
- B. The end of the SWIS
- C. The bottom of the SWIS
- D. The drain
- E. The drainage pipe
- F. None of the Above

103. As _____ and the permeability decreases, the necessary separation distance increases. A 10-foot separation is used for most applications.

- A. The permeability decreases
- B. The vertical distance increases
- C. The porous medium
- D. The saturated hydraulic conductivity
- E. The drainable porosity
- F. None of the Above

104. If both ends of the drain cannot be extended to the ground surface, the upslope end should be extended some distance along the surface contour beyond _____.

- A. The design of a curtain drain
- B. The end of the SWIS
- C. The bottom of the SWIS
- D. The drain
- E. The drainage pipe
- F. None of the Above

105. The design of a curtain drain is based on the permeability of _____, the size of the area upslope of the SWIS that contributes water to the saturated zone, the gradient of the drainage pipe, and a suitable outlet configuration.

- A. The design of a curtain drain
- B. The end of the SWIS
- C. The bottom of the SWIS
- D. The soil in the saturated zone
- E. The drainage pipe
- F. None of the Above

106. If the saturated hydraulic conductivity is low and _____ is small, even effectively designed curtain drains might have limited effect on soil wetness conditions.

- A. The permeability decreases
- B. The drain
- C. The porous medium
- D. The saturated hydraulic conductivity
- E. The drainable porosity
- F. None of the Above

Inspections and Maintenance Requirements

107. The primary function of the septic tank is to settle out solids from _____.

- A. Infiltration surfaces
- B. Seepage pits
- C. SWISs
- D. The wastewater
- E. Solids to settle
- F. None of the Above

108. Solids are allowed to settle out by holding the sewage in _____ within the tank. Typically, 24 to 48 hours of settling is required.

- A. A quiet environment
- B. Settling time
- C. SWIS application(s)
- D. The proper environment for solids to settle
- E. Seepage pit(s)
- F. None of the Above

109. As the solids build up, there is less room in the tank for the liquid and thus less _____.

- A. Infiltration surfaces
- B. Settling time
- C. SWIS application(s)
- D. The wastewater
- E. Seepage pit(s)
- F. None of the Above

110. The most important issue with any tank, whether it is concrete, plastic, or fiberglass, is that it must be watertight. _____ is important for two reasons: wastewater must be kept in the tank so that it does not contaminate the groundwater, and groundwater must be kept out of the tank so that the tank is not over filled. The only way to make sure a tank is watertight is to have it pumped and visually inspect the inside of the tank.

- A. Infiltration surfaces
- B. Seepage pits
- C. SWISs
- D. The wastewater
- E. Watertightness
- F. None of the Above

111. Septic tanks can have either of these components and regardless of which one, they must be inspected. The purpose of _____ is to slow the wastewater coming into the septic tank to ensure the proper environment for solids to settle.

- A. Baffles and tees
- B. Settling time
- C. SWIS application(s)
- D. The proper environment for solids to settle
- E. Seepage pit(s)
- F. None of the Above

SWIS Designs

112. SWIS applications differ in their geometry and location in _____. Trenches have a large length-to-width ratio, while beds have a wide, rectangular or square geometry.

- A. The soil profile
- B. Settling time
- C. SWIS application(s)
- D. The proper environment for solids to settle
- E. Seepage pit(s)
- F. None of the Above

113. Which of the following terms are deep, circular excavations that rely almost completely on sidewall infiltration?

- A. Infiltration surfaces
- B. Seepage pits
- C. SWISs
- D. The wastewater
- E. Solids to settle
- F. None of the Above

114. Which of the following terms are no longer permitted in many jurisdictions because their depth and relatively small horizontal profile create a greater point-source pollutant loading potential to ground water than other geometries?

- A. Solids
- B. Settling time
- C. SWIS application(s)
- D. The proper environment for solids to settle
- E. Seepage pit(s)
- F. None of the Above

115. Which of the following terms may be created in natural soil or imported fill material?

- A. Infiltration surfaces
- B. Seepage pits
- C. SWISs
- D. The wastewater
- E. Solids to settle
- F. None of the Above

116. Most traditional systems are constructed below ground surface in natural soil. In some instances, _____ may be removed and the excavation filled with suitable porous material in which to construct the infiltration surface.

- A. Seepage pits
- B. Settling time
- C. SWIS application(s)
- D. The proper environment for solids to settle
- E. A restrictive horizon above a more permeable horizon
- F. None of the Above

117. Which of the following terms may be constructed at the ground surface ("at-grades") or elevated in imported fill material above the natural soil surface ("mounds")?

- A. Infiltration surfaces
- B. Seepage pits
- C. SWISs
- D. The wastewater
- E. Solids to settle
- F. None of the Above

118. An important difference between infiltration surfaces constructed in natural soil and those constructed in fill material is that _____ is created at the fill/natural soil interface.

- A. A secondary infiltrative surface
- B. Settling time
- C. SWIS application(s)
- D. The proper environment for solids to settle
- E. Seepage pit(s)
- F. None of the Above

Tank Pumped

119. Another part of the inspection process, after having the tank pumped, is to visually inspect the inlet and outlet pipes for _____.

- A. The drainfield
- B. The tank
- C. The effluent T-pipe
- D. The inlet and outlet baffles and screens
- E. The presence of water entering the tank
- F. None of the Above

120. If water is running into the tank, it may indicate a leak within the plumbing of the home or infiltration in _____.

- A. A pressure sewer
- B. The inlet pipe
- C. The hydraulic load
- D. The removal of organic material
- E. Total household wastewater
- F. None of the Above

121. Water draining back into the septic tank from _____ may indicate a drainfield problem. If that is occurring, the drainfield may be clogged and require further inspection.

- A. The drainfield
- B. The outlet pipe
- C. The effluent T-pipe
- D. The inlet and outlet baffles and screens
- E. The scum layer
- F. None of the Above

Effluent Filter

122. Another septic tank component that needs to be inspected, if in use, is the effluent filter. These filters are located on the outlet side of the tank, in _____.

- A. Sludge and scum depth(s)
- B. Clarified wastewater
- C. The inlet pipe
- D. The effluent filter or screen
- E. The outlet tee
- F. None of the Above

123. The filter needs to be maintained as well, so as not to allow solids to carry over into the drainfield. Maintenance of these filters consists of pulling the filter and hosing the contents back into the septic tank. Another item to consider is the use of _____.

- A. The drainfield
- B. The tank
- C. The effluent T-pipe
- D. The inlet and outlet baffles and screens
- E. "Manhole" risers
- F. None of the Above

Septic Tank Operation and Maintenance

124. Which of the following term is a passive treatment unit that typically requires little operator intervention? Regular inspections, septage pumping, and periodic cleaning of the effluent filter or screen are the only operation and maintenance requirements.

- A. Sludge and scum depth(s)
- B. Clarified wastewater
- C. The inlet pipe
- D. The effluent filter or screen
- E. The septic tank
- F. None of the Above

Septic Tank Inspections

125. Inspections are performed to observe sludge and scum accumulations, structural soundness, watertightness, and condition of the inlet and outlet baffles and screens.

- A. The drainfield
- B. The tank
- C. The effluent T-pipe
- D. The inlet and outlet baffles and screens
- E. The scum layer
- F. None of the Above

Sludge and Scum Accumulations

126. If the sludge layer rises to the bottom of _____, solids can be drawn through the effluent port and transported into the infiltration field, increasing the risk of clogging.

- A. The drainfield
- B. The tank
- C. The effluent T-pipe
- D. The inlet and outlet baffles and screens
- E. The scum layer
- F. None of the Above

127. Likewise, if the bottom of _____ moves lower than the bottom of the effluent T-pipe, oils and other scum material can be drawn into the piping that discharges to the infiltration field. Various devices are commercially available to measure sludge and scum depths.

- A. Sludge and scum depth(s)
- B. Clarified wastewater
- C. The thickening scum layer
- D. The effluent filter or screen
- E. Watertightness
- F. None of the Above

128. The scum layer should not extend above the top or below the bottom of either the inlet or outlet tees. The top of the sludge layer should be at least 1 foot below the bottom of either tee or baffle. Usually, the sludge depth is greatest below _____.

- A. The drainfield
- B. The inlet baffle
- C. The effluent T-pipe
- D. The inlet and outlet baffles and screens
- E. The scum layer
- F. None of the Above

129. The scum layer bottom must not be less than 3 inches above the bottom of the outlet tee or baffle. If any of these conditions are present, there is a risk that wastewater solids will plug _____ or be carried out in the tank effluent and begin to clog the SWIS.

- A. Sludge and scum depth(s)
- B. Clarified wastewater
- C. The tank inlet
- D. The effluent filter or screen
- E. Watertightness
- F. None of the Above

Structural Soundness and Watertightness

130. Structural soundness and watertightness are best observed after the septage has been pumped from the tank. The interior tank surfaces should be inspected for deterioration, such as pitting, spalling, delamination, and so forth and for _____.

- A. Irregularities
- B. Watertightness
- C. Cracks and holes
- D. Other undesirable substances
- E. The anaerobic process
- F. None of the Above

131. Which of the following terms can be checked by observing the liquid level (before pumping), observing all joints for seeping water or roots, and listening for running or dripping water?

- A. Irregularities
- B. Watertightness
- C. Settling stage
- D. Other undesirable substances
- E. The anaerobic process
- F. None of the Above

Baffles and Screens

132. If _____ is fitted to the outlet baffle, it should be removed, cleaned, inspected for irregularities, and replaced. Note that effluent screens should not be removed until the tank has been pumped or the outlet is first plugged.

- A. An effluent screen
- B. Pressure manifold(s)
- C. Mechanical aeration equipment
- D. Distribution boxes, drop boxes, and step-downs
- E. Discharge or absorption
- F. None of the Above

Groundwater Plume

133. The plume descends in the ground water as the ground water is recharged from the surface, but the amount of dispersion of the plume can be variable. Thus, drinking water wells some distance from a _____ can be threatened if they are directly in the path of a percolate plume.

- A. Disinfecting stage
- B. Aeration stage
- C. Traditional septic system
- D. SWIS
- E. Waste products in the water
- F. None of the Above

Aerobic Treatment Systems Introduction

134. An aerobic treatment system or ATS, often called incorrectly an aerobic septic system is a small scale sewage treatment system similar to a septic tank system, but which uses an aerobic process for digestion rather than just _____ used in septic systems.

- A. Irregularities
- B. The aerobic process
- C. Settling stage
- D. Other undesirable substances
- E. The anaerobic process
- F. None of the Above

135. Unlike the traditional septic system, the aerobic treatment system produces a high quality secondary effluent, which can be sterilized and used for surface irrigation. This allows much greater flexibility in the placement of _____, as well as cutting the required size of the leach field by as much as half.

- A. Disinfecting stage
- B. Aeration stage
- C. Traditional septic system
- D. The leach field
- E. Waste products in the water
- F. None of the Above

The ATS process generally consists of the following phases:

136. Which of the following terms remove large solids and other undesirable substances from the wastewater; this stage acts much like a septic system, and an ATS may be added to an existing septic tank to further process the primary effluent?

- A. Disinfecting stage
- B. Aeration stage
- C. Traditional septic system
- D. Pre-treatment stage
- E. Waste products in the water
- F. None of the Above

137. Which of the following terms where the aerobic bacteria digest the biological wastes in the wastewater?

- A. Disinfecting stage
- B. Aeration stage
- C. Traditional septic system
- D. SWIS
- E. Waste products in the water
- F. None of the Above

138. Which of the following terms allows any undigested solids to settle. This forms a sludge which must be periodically removed from the system?

- A. Settling stage
- B. Aeration system(s)
- C. The hydraulic load
- D. The removal of organic material
- E. Total household wastewater
- F. None of the Above

139. Which of the following terms is where chlorine or similar disinfectant is mixed with the water, to produce an antiseptic output?

- A. Disinfecting stage
- B. Aeration stage
- C. Traditional septic system
- D. SWIS
- E. Waste products in the water
- F. None of the Above

140. The disinfecting stage is optional, and is used where _____ is required, such as cases where the effluent is distributed above ground. The disinfectant typically used is tablets of calcium hypochlorite, which are specially made for waste treatment systems.

- A. A sterile effluent
- B. Watertightness
- C. Settling stage
- D. Other undesirable substances
- E. The anaerobic process
- F. None of the Above

141. Since the ATS contains a living ecosystem of microbes to digest the waste products in the water, excessive amounts of items such as bleach or antibiotics can damage the ATS environment and reduce _____. Non-digestible items should also be avoided, as they will build up in the system and require more frequent sludge removal.

- A. Infiltration area
- B. Treatment effectiveness
- C. Entire infiltration surface
- D. Proposed infiltration surface elevation
- E. Light-weight gravel-less systems
- F. None of the Above

Gravity Effluent Distribution Devices

142. Divide and/or transport the liquid effluent from a septic tank or ATU to _____ for dispersal into the soil. These devices include distribution boxes, drop boxes, and step-downs.

- A. The system
- B. Pressure manifold(s)
- C. Mechanical aeration equipment
- D. Absorption trenches
- E. Discharge or absorption
- F. None of the Above

Gravity Laterals

143. A system of trenches excavated along ground contours used to distribute effluent by gravity flow from a septic tank or ATU and apply the effluent to _____ . Generally, 18-inch deep trenches are used; however, with approval trenches can be up to 30 inches deep.

- A. A pressure sewer
- B. Aeration system(s)
- C. The hydraulic load
- D. The removal of organic material
- E. The soil infiltrative surface
- F. None of the Above

Dosed Gravity Systems

144. Use siphons or pumps to dose into _____ or through a pressure manifold into the ends of gravity lateral trenches.

- A. A pressure sewer
- B. Aeration system(s)
- C. The hydraulic load
- D. The removal of organic material
- E. A gravity distribution device
- F. None of the Above

145. Pressure manifolds can be used to more equally divide effluent between _____ or to proportion effluent to unequal length trenches; however, effluent is still moved along the length of a trench by gravity.

- A. The system
- B. Pressure manifold(s)
- C. Mechanical aeration equipment
- D. Distribution boxes, drop boxes, and step-downs
- E. Gravity lateral trenches
- F. None of the Above

Lagoons (Wastewater Stabilization Ponds)

146. Sealed earthen basins, which use _____ to treat wastewater.

- A. A pressure sewer
- B. Aeration system(s)
- C. The hydraulic load
- D. The removal of organic material
- E. Natural unaided biological processes
- F. None of the Above

147. Alternative (Enhanced) Treatment Methods Alternative treatment systems, such as sand filters and aeration systems provide treatment for the removal of organic material and some pathogens from _____. These units can be adapted and scaled to handle the full size range from single-home onsite systems through municipal plants.

- A. A pressure sewer
- B. Aeration system(s)
- C. The hydraulic load
- D. The removal of organic material
- E. The wastewater before discharge or absorption
- F. None of the Above

Strength of Wastewater

148. A substantial portion of the organic load is removed by a septic tank, so the strength of wastewater in a STEP (Septic Tank Effluent Pump) system would be lower than _____.

- A. A pressure sewer
- B. Aeration system(s)
- C. The hydraulic load
- D. The removal of organic material
- E. Total household wastewater
- F. None of the Above

149. The effluent from a grinder pump system will contain all material from household's wastewater. Because it will have lower I & I, it will be stronger than _____.

- A. Household's wastewater
- B. Infiltration
- C. Discharge or absorption
- D. Other inert material
- E. The wastewater from a gravity sewer
- F. None of the Above

150. The design of a plant will need to be checked to be sure that it can handle the organic load as well as _____.

- A. A pressure sewer
- B. Aeration system(s)
- C. The hydraulic load
- D. The removal of organic material
- E. Total household wastewater
- F. None of the Above

Chapter 3 - Subsurface Wastewater Infiltration Construction Section

151. Appropriate wastewater treatment system construction and/or installation practices are critical to the performance of _____.

- A. Long-term performance
- B. System densities
- C. Individual and clustered systems
- D. Conventional onsite system installation(s)
- E. Infiltration area protection
- F. None of the Above

152. Construction activities can affect short-term and long-term system performance by failing to adhere to material specifications, neglecting _____ requirements, inadvertently switching tank inlet/outlet orientation, or failing to protect infiltration area soils from equipment compaction.

- A. Proper pipe slope
- B. Conventional systems
- C. Septic tank effluent
- D. Assimilate wastewater flows
- E. Tank inlet/outlet orientation
- F. None of the Above

153. Which of the following terms is a key component of good system installation practice, should be carefully considered during site preparation, construction equipment selection and use, and before and during construction?

- A. Long-term performance
- B. System densities
- C. Individual and clustered systems
- D. Conventional onsite system installation(s)
- E. Infiltration area protection
- F. None of the Above

154. Onsite wastewater treatment systems (OWTSSs) have evolved from the pit privies used widely throughout history to installations capable of producing a disinfected effluent that is fit for _____.

- A. Human consumption
- B. Conventional systems
- C. Septic tank effluent
- D. Assimilate wastewater flows
- E. Tank inlet/outlet orientation
- F. None of the Above

155. Septic tanks remove most settleable and floatable material and function as an anaerobic bioreactor that promotes _____.

- A. Long-term performance
- B. System densities
- C. Individual and clustered systems
- D. Conventional onsite system installation(s)
- E. Partial digestion of retained organic matter
- F. None of the Above

156. Septic tank effluent, which contains significant concentrations of pathogens and nutrients, has traditionally been discharged to soil, sand, or other media absorption fields (SWISs) for further treatment through biological processes, adsorption, filtration, and _____.

- A. Infiltration into underlying soils
- B. Conventional systems
- C. Septic tank effluent
- D. Assimilate wastewater flows
- E. Tank inlet/outlet orientation
- F. None of the Above

157. Conventional systems work well if they are installed in areas with appropriate soils and hydraulic capacities; designed to treat the _____ to meet public health, ground water, and surface water performance standards; installed properly; and maintained to ensure long-term performance.

- A. Long-term performance
- B. System densities
- C. Incoming waste load
- D. Conventional onsite system installation(s)
- E. Infiltration area protection
- F. None of the Above

Background and Use of Onsite Wastewater Treatment Systems

158. Only about one-third of the land area in the United States has _____ suited for conventional subsurface soil absorption fields.

- A. Pit privies
- B. Conventional systems
- C. Septic tank effluent
- D. Soils
- E. Tank inlet/outlet orientation
- F. None of the Above

159. System densities in some areas exceed the capacity of even suitable soils to assimilate wastewater flows and retain and transform their _____.

- A. Long-term performance
- B. Contaminants
- C. Individual and clustered systems
- D. Conventional onsite system installation(s)
- E. Infiltration area protection
- F. None of the Above

160. Many systems are located too close to ground water or surface waters and others, particularly in rural areas with newly installed public water lines, are not designed to handle _____.

- A. Increasing wastewater flows
- B. Conventional systems
- C. Septic tank effluent
- D. Assimilate wastewater flows
- E. Tank inlet/outlet orientation
- F. None of the Above

161. Conventional onsite system installations might not be adequate for minimizing nitrate contamination of ground water, removing phosphorus compounds, and _____.

- A. The water phase
- B. Secondary effluent
- C. Attenuating pathogenic organisms
- D. Nutrients and organic matter
- E. Final treatment of the effluent
- F. None of the Above

162. Which of the following terms leach into ground water used as a drinking water source can cause methemoglobinemia, or blue baby syndrome, and other health problems for pregnant women?

- A. Acid forming bacteria
- B. BOD removal efficiency
- C. Colloidal particles
- D. Lead
- E. Nitrates
- F. None of the Above

163. Which of the following terms discharged into surface waters directly or through subsurface flows can spur algal growth and lead to eutrophication and low dissolved oxygen in lakes, rivers, and coastal areas?

- A. Nitrates and phosphorus
- B. BOD removal efficiency
- C. Colloidal particles
- D. Lead
- E. Nitrates
- F. None of the Above

164. Which of the following terms reaching ground water or surface waters can cause human disease through direct consumption, recreational contact, or ingestion of contaminated shellfish? Sewage might also affect public health as it backs up into residences or commercial establishments because of OWTS failure.

- A. Acid forming bacteria
- B. BOD removal efficiency
- C. Colloidal particles
- D. Notable exception of nitrogen (N)
- E. Pathogens
- F. None of the Above

Septic Site Preparation and Excavation Practices

165. Site preparation requires a number of activities including clearing and surface preparation for filling. Use of lightweight tracked equipment will minimize _____.

- A. Loamy Sand compaction
- B. Silt Loam compaction
- C. Clay compaction
- D. Silty Clay Loam compaction
- E. Soil compaction
- F. None of the Above

166. Which of the following terms should be determined to ensure that it is dry, and care should be taken to avoid soil disturbance as much as possible?

- A. Surface runoff
- B. Drainfield installation
- C. Infiltration surface
- D. Wind-blown silt or raindrop impact
- E. Soil moisture
- F. None of the Above

167. To avoid potential soil damage during construction, the soil below the _____ must be below its plastic limit during construction.

- A. Infiltration area
- B. Infiltration trenches
- C. Entire infiltration surface
- D. Proposed infiltration surface elevation
- E. Light-weight gravel-less systems
- F. None of the Above

168. Site excavation is conducted only when the _____ can be covered the same day to avoid loss of soil permeability from wind-blown silt or raindrop impact.

- A. Surface runoff
- B. Drainfield installation
- C. Infiltration surface
- D. Wind-blown silt or raindrop impact
- E. Soil moisture
- F. None of the Above

169. Another solution is to use _____, which reduce the damage and speed the construction process.

- A. Infiltration area
- B. Infiltration trenches
- C. Entire infiltration surface
- D. Proposed infiltration surface elevation
- E. Light-weight gravel-less systems
- F. None of the Above

170. Heavy equipment should be diverted from the absorption field to avoid compaction and damage to the area. Flagging off the _____ as early as possible is critical to ensure long-term function of the system.

- A. Infiltration area
- B. Infiltration trenches
- C. Entire infiltration surface
- D. Proposed infiltration surface elevation
- E. Light-weight gravel-less systems
- F. None of the Above

171. Scarifying the surface with the teeth of a backhoe bucket is not sufficient. All efforts should be made to avoid any disturbance to the exposed _____.

- A. Surface runoff
- B. Drainfield installation
- C. Infiltration surface
- D. Wind-blown silt or raindrop impact
- E. Soil moisture
- F. None of the Above

Field Construction Practices

172. Which of the following terms in infiltration trenches should be scarified and the surface gently raked prior to installing the gravel or gravel-less piping/chambers?

- A. Infiltration area
- B. Infiltration trenches
- C. Entire infiltration surface
- D. Proposed infiltration surface elevation
- E. Smearred soil surfaces
- F. None of the Above

173. If gravel or crushed rock is to be used for the system medium, the rock should be placed in the trench by using the backhoe bucket to_____. If soil compaction occurs during drainfield installation, it might be possible to restore the area, but only by removing the compacted layer.

- A. Surface runoff
- B. Drainfield installation
- C. Infiltration surface
- D. Long-term system performance
- E. Soil moisture
- F. None of the Above

174. Consequences of the removal of this amount of soil over the entire infiltration surface can be significant. It will reduce the separation distance to the _____ and could place the infiltration surface in an unacceptable soil horizon.

- A. Infiltration area
- B. Infiltration trenches
- C. Entire infiltration surface
- D. Proposed infiltration surface elevation
- E. Restrictive horizon
- F. None of the Above

Soil Texture – Identify The Term

175. Individual grains can be seen and felt readily. Squeezed in the hand when dry, this soil will fall apart when the pressure is released.

- A. Loamy Sand
- B. Silt Loam
- C. Clay
- D. Silty Clay Loam
- E. Sand
- F. None of the Above

176. Consists largely of sand, but has enough silt and clay present to give it a small amount of stability. Individual sand grains can be readily seen and felt.

- A. Sandy Loam
- B. Loam
- C. Silty Clay
- D. Clay Loam
- E. Loamy Sand
- F. None of the Above

177. Consists of a moderate amount of fine grades of sand, a small amount of clay, and a large quantity of silt particles.

- A. Loamy Sand
- B. Silt Loam
- C. Clay
- D. Silty Clay Loam
- E. Sand
- F. None of the Above

178. Squeezed in the hand when dry, this soil will readily fall apart when the pressure is released.

- A. Sandy Loam
- B. Loam
- C. Silty Clay
- D. Clay Loam
- E. Loamy Sand
- F. None of the Above

179. When moist, a thin, long ribbon or 1/16-inch wire can be molded with ease. Fingerprints will show on the soil, and a dull to bright polish is made on the soil by a shovel.

- A. Loamy Sand
- B. Silt Loam
- C. Clay
- D. Silty Clay Loam
- E. Sand
- F. None of the Above

180. Squeezed when moist, it will form a cast that will hold its shape when the pressure is released but will crumble when touched.

- A. Loamy Sand
- B. Silt Loam
- C. Clay
- D. Silty Clay Loam
- E. Sand
- F. None of the Above

181. Consists of an even mixture of the different sizes of sand and of silt and clay. It is easily crumbled when dry and has a slightly gritty, yet fairly smooth feel.

- A. Sandy Loam
- B. Loam
- C. Silty Clay
- D. Clay Loam
- E. Loamy Sand
- F. None of the Above

182. Consists of a moderate amount of clay, a large amount of silt, and a small amount of sand. It breaks into moderately hard clods or lumps when dry. When moist, a thin ribbon or 1/8-inch wire can be formed between thumb and finger that will sustain its weight and will withstand gentle movement.

- A. Loamy Sand
- B. Silt Loam
- C. Clay
- D. Silty Clay Loam
- E. Sand
- F. None of the Above

183. Consists of even amounts of silt and clay and very small amounts of sand. It breaks into hard clods or lumps when dry.

- A. Sandy Loam
- B. Loam
- C. Silty Clay
- D. Clay Loam
- E. Loamy Sand
- F. None of the Above

184. Consists of large amounts of clay and moderate to small amounts of sand and silt. It breaks into very hard clods or lumps when dry.

- A. Loamy Sand
- B. Silt Loam
- C. Clay
- D. Silty Clay Loam
- E. Sand
- F. None of the Above

185. Consists of an even mixture of sand, silt, and clay that breaks into clods or lumps when dry.

- A. Sandy Loam
- B. Loam
- C. Silty Clay
- D. Clay Loam
- E. Loamy Sand
- F. None of the Above

186. Lumps in a dry, undisturbed state appear quite cloddy, but they can be pulverized readily; the soil then feels soft and floury.

- A. Loamy Sand
- B. Silt Loam
- C. Clay
- D. Silty Clay Loam
- E. Sand
- F. None of the Above

187. Squeezed when moist, it forms a cast that will not only hold its shape when the pressure is released but will withstand careful handling without breaking. The stability of the moist cast differentiates this soil from sand.

- A. Sandy Loam
- B. Loam
- C. Silty Clay
- D. Clay Loam
- E. Loamy Sand
- F. None of the Above

188. Consists primarily of sand, but has enough silt and clay to make it somewhat cohesive.

- A. Loamy Sand
- B. Silt Loam
- C. Clay
- D. Silty Clay Loam
- E. Sand
- F. None of the Above

Chapter 4 -Wastewater Collection Section

Understanding Gravity Sanitary Sewers

189. Sanitary sewers are designed to transport the wastewater by utilizing the missing term provided by the natural elevation of the earth resulting in a downstream flow.

- A. Potential energy
- B. Peak flow of population
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. SSO
- F. None of the Above

190. Sewer systems are designed to maintain proper flow velocities with?

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Both wet and dry weather flows
- E. Minimum head loss
- F. None of the Above

191. Which of the following terms may find it necessary to dissipate excess potential energy?

- A. I/I
- B. Peak flow of population
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. Higher elevations in the system
- F. None of the Above

192. Which of the following terms is determined largely by population served, density of population, and water consumption?

- A. Design flow(s)
- B. Stormwater inflow
- C. Flow
- D. In flow
- E. I and I
- F. None of the Above

193. Sanitary sewers should be designed for?

- A. I/I
- B. Peak flow of population
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

194. Most of the time the flow surface is exposed to the atmosphere within the sewer and it functions as?

- A. I/I
- B. Peak flow of population
- C. An open channel
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

195. Which of the following terms produces low pressure in the sewer system?

- A. Surge
- B. Stormwater inflow
- C. I/I
- D. Dry weather flows
- E. Low pressure
- F. None of the Above

196. In order to design a sewer system, many factors are considered. The purpose of this topic is to aid in the understanding of?

- A. I/I
- B. Peak flow of population
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

Sewer System Capacity Evaluation - Testing and Inspection

197. The collection system owner or operator should have a program in place to periodically evaluate _____ in both wet and dry weather flows and ensure the capacity is maintained as it was designed.

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Capacity of the sewer system
- E. Low pressure in the sewer system
- F. None of the Above

198. The capacity evaluation program evaluation begins with an inventory and characterization of the?

- A. I/I
- B. System components
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

199. The system then undergoes general inspection which serves to continuously update and add to the?

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Inventory information
- E. Low pressure in the sewer system
- F. None of the Above

Flow Monitoring

200. Flow monitoring provides information on dry weather flows as well as areas of the collection system potentially affected by?

- A. I/I
- B. Peak flow of population
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

201. Which of the following terms may also be performed for billing purposes, to assess the need for new sewers in a certain area, or to calibrate a model?

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Both wet and dry weather flows
- E. Flow measurement
- F. None of the Above

Flow Monitoring Plan

202. In some cases, the data is calibrated rather than the flow meter. Checks should include taking independent water level, cleaning accumulated debris and silt from the flow meter area, downloading data, and checking the desiccant and battery state. Records of each inspection should be maintained.

- A. True
- B. False

Flow Measurements

203. Base flow is generally taken to mean the wastewater generated without any?

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. Any I/I component
- F. None of the Above

204. Which of the following terms is the seepage of groundwater into pipes or manholes through defects such as cracks, broken joints, etc.?

- A. Velocity
- B. Infiltration
- C. RII
- D. Blockage(s)
- E. Sewer cleaning
- F. None of the Above

205. Which of the following terms is the water which enters the sewer through direct connections such as roof leaders, direct connections from storm drains or yard, area?

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. Any I/I component
- F. None of the Above

206. Many collection system owners or operators add a third classification: rainfall induced infiltration (RII).

- A. True
- B. False

207. Although not from piped sources, this term tends to act more like inflow than infiltration.

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. RII
- F. None of the Above

208. Other methods of inspecting flows may be employed, such as visually monitoring manholes during low-flow periods to determine areas with?

- A. Velocity
- B. Infiltration
- C. RII
- D. Blockage(s)
- E. Excessive I/I
- F. None of the Above

Flow Capacity

209. Most sewers are designed with the capacity to flow quarter full for less than 15 inches in diameter; larger sewers are designed to flow at half flow.

- A. True
- B. False

210. The minimum velocity is necessary to prevent the?

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. Any I/I component
- F. None of the Above

Sewer Cleaning

211. The purpose of sewer cleaning is to remove accumulated material from the sewer. Cleaning helps to prevent?

- A. Velocity
- B. Infiltration
- C. RII
- D. Blockage(s)
- E. Sewer cleaning
- F. None of the Above

212. Which of the following terms in gravity sewers are usually caused by a structural defect, poor design, poor construction, an accumulation of material in the pipe?

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. Any I/I component
- F. None of the Above

213. Protruding traps may catch debris, which then causes a further buildup of?

- A. Velocity
- B. Infiltration
- C. RII
- D. Blockage(s)
- E. Solids
- F. None of the Above

Sewer Cleaning Methods

214. Mechanical cleaning uses physical devices to scrape, cut, or pull?

- A. Velocity
- B. Infiltration
- C. Material from the sewer
- D. Blockage(s)
- E. Sewer cleaning
- F. None of the Above

215. Chemical cleaning can facilitate the control of odors, grease buildup, root growth, corrosion, and insect and?

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. Rodent infestation
- F. None of the Above

Sewer Cleaning Records

216. The backbone of an effective sewer cleaning program is accurate recordkeeping. Accurate recordkeeping provides the collection system owner or operator with information on the areas.

- A. True
- B. False

217. The owner or operator should also be able to identify the number of stoppages experienced per mile of sewer pipe. If the system is experiencing a steady increase in stoppages, the reviewer should try to determine the cause (i.e., lack of preventive maintenance funding, deterioration of the sewers due to age, an increase in?

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. Breakdown or malfunction
- F. None of the Above

Parts and Equipment Inventory

218. The inventory should be based on the equipment manufacturer's recommendations, supplemented by historical experience with?

- A. Both infiltration and inflow or I/I
- B. Inflow
- C. Potential problem areas
- D. Maintenance and equipment problems
- E. Equipment problems
- F. None of the Above

219. Without such an inventory, the collection system may experience long down times or periods of inefficient operation in the event of a?

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. Breakdown or malfunction
- F. None of the Above

Infiltration and Inflow- What is Infiltration/Inflow (I/I)?

220. Which of the following terms occurs when groundwater enters the sewer system through cracks, holes, faulty connections, or other openings?

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. Breakdown or malfunction
- F. None of the Above

221. Which of the following terms occurs when surface water such as storm water enters the sewer system through roof downspout connections, holes in manhole covers, illegal plumbing connections, or other defects?

- A. Both infiltration and inflow or I/I
- B. Inflow
- C. Potential problem areas
- D. General I/I source areas
- E. Equipment problems
- F. None of the Above

222. The sanitary sewer collection system and treatment plants have _____ that can be handled.

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. Breakdown or malfunction
- F. None of the Above

Determining I/I

223. Flow monitoring and flow modeling provide measurements and data used to determine estimates of?

- A. Both infiltration and inflow or I/I
- B. I/I
- C. Potential problem areas
- D. General I/I source areas
- E. Equipment problems
- F. None of the Above

224. Measurements taken before and after a precipitation event indicate the extent that _____ is increasing total flow.

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. I/I
- F. None of the Above

225. Infiltration increases when groundwater rises from precipitation, and inflow is mainly stormwater and rainwater. Rainfall monitoring is also performed to correlate this data.

- A. True
- B. False

Identifying sources of I/I

226. Visual inspection - accessible pipes, gutter and plumbing connections, and manholes are visually inspected for?

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Faults
- F. None of the Above

227. Smoke testing – smoke is pumped into sewer pipes. Its reappearance aboveground indicates points of ?

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal plumbing, drains, and roof downspouts
- F. None of the Above

228. TV inspection – camera equipment is used to do?

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Faults
- F. None of the Above

229. Dye testing – Dye is used at suspected _____ sources.
- A. I/I
 - B. High wet weather flows
 - C. Stormwater and rainwater
 - D. Smoke testing and dyed water testing
 - E. Illegal plumbing, drains, and roof downspouts
 - F. None of the Above

230. Which of the following terms are also sometimes identified when sewer backups or overflows bring attention to that part of the system?

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Faults
- F. None of the Above

Repairing I/I Sources

231. Repair techniques include manhole wall spraying, Insituform pipe relining, manhole frame and lid replacement, and disconnecting?

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal plumbing, drains, and roof downspouts
- F. None of the Above

Efficient Identification of Excessive I/I

232. The owner or operator should have in place a program for the efficient identification of?

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Faults
- F. None of the Above

233. Areas with high wet weather flows should then be subject to?

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Inspection and rehabilitation activities
- F. None of the Above

Sewer System Testing

234. Sewer system testing techniques are often used to identify leaks which allows this term into the sewer system and determine the location of illicit connections and other sources of stormwater inflow?

- A. Exfiltration
- B. Excessive I/I
- C. Sources of I/I
- D. Unwanted infiltration
- E. Flow
- F. None of the Above

235. Two commonly implemented techniques include?

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal plumbing, drains, and roof downspouts
- F. None of the Above

236. Which of the following terms is a relatively inexpensive and quick method of detecting sources of inflow in sewer systems?

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Smoke testing
- F. None of the Above

237. Which of the following terms can be identified when smoke escapes through them.

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Sources of inflow
- F. None of the Above

238. The weather conditions in which this term is conducted?

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Smoke testing
- F. None of the Above

239. Building inspections are sometimes conducted as part of a smoke testing program and, in some cases, may be the only way to find?

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal connections
- F. None of the Above

240. If traces of the smoke or its odor enter the building, it is an indication that this term may also be entering.

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Gases from the sewer system
- E. Faults
- F. None of the Above

Dye Testing

241. Dyed water testing may be used to establish this term to the sewer.

- A. Smoke testing
- B. Potential problem areas
- C. I/I problems
- D. Presence of roots
- E. Connection of a fixture or appurtenance
- F. None of the Above

242. Which of the following terms can be used to identify structurally damaged manholes that might create potential I/I problems?

- A. Smoke testing
- B. Potential problem areas
- C. I/I problems
- D. The presence of roots
- E. Dyed water testing
- F. None of the Above

Sewer System Inspection

243. Which of the following terms and pipelines are the first line of defense in the identification of existing or potential problem areas?

- A. Smoke testing
- B. Potential problem areas
- C. Visual inspection of manholes
- D. The presence of roots
- E. Dyed water testing
- F. None of the Above

244. Visual inspections provide additional information concerning the accuracy of system mapping, the presence and?

- A. Smoke testing
- B. Potential problem areas
- C. I/I problems
- D. The presence of roots
- E. Degree of I/I problems
- F. None of the Above

245. By observing the manhole directly and the incoming and outgoing lines with _____, and it is possible to determine structural condition, the presence of roots, condition of joints, depth of debris in the line, and depth of flow.
- A. Smoke testing
 - B. Potential problem areas
 - C. I/I problems
 - D. The presence of roots
 - E. Dyed water testing
 - F. None of the Above

Sewer System Inspection Techniques

246. There are a number of inspection techniques that may be employed to inspect a sewer system. The reviewer should determine if an inspection program includes frequency and schedule of inspections and procedures to record the results.
- A. True
 - B. False

247. Sewer system cleaning should always be considered before this term is performed in order to provide adequate clearance and inspection results.
- A. Sewer system cleaning
 - B. Capacity evaluation
 - C. Inspection
 - D. Closed Circuit Television (CCTV) inspections
 - E. Confined space entry
 - F. None of the Above

Closed Circuit Television (CCTV) Inspections

248. Which of the following terms are a helpful tool for early detection of potential problems?
- A. Sewer system cleaning
 - B. Capacity evaluation
 - C. Odor
 - D. Closed Circuit Television (CCTV) inspections
 - E. Grade 1 Operator
 - F. None of the Above

249. Which of the following terms may be done on a routine basis as part of the preventive maintenance program, as well as part of an investigation into the cause of I/I?
- A. Lamping
 - B. Camera inspection
 - C. Sonar
 - D. CCTV inspections
 - E. Sewer scanner and evaluation
 - F. None of the Above

250. A benefit of which of the following terms is that a permanent visual record is captured for subsequent reviews?
- A. Sewer system cleaning
 - B. Capacity evaluation
 - C. Trenchless technologies
 - D. CCTV inspection
 - E. Confined space entry
 - F. None of the Above

Sewer System Rehabilitation

251. The collection system owner or operator should have a?
- A. Sewer system program
 - B. Capacity evaluation program
 - C. Problem solving program
 - D. Sewer rehabilitation program
 - E. Lamping training program
 - F. None of the Above

252. The rehabilitation program should build on information obtained as a result of all forms of maintenance and observations made as part of the sewer system cleaning to assure the continued ability of the system to provide sales and service at the greatest cost.
- A. True
 - B. False

253. There are many rehabilitation methods; the choice of methods depends on pipe size, type, location, dimensional changes, sewer flow, material deposition, surface conditions, and?

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Warm, moist, nutrient rich atmosphere
- E. Severity of I/I
- F. None of the Above

254. Manhole covers can allow significant inflow to enter the system because they are often located in the?

- A. Sanitary sewer service line
- B. Debris discharged
- C. Rehabilitation program
- D. Path of surface runoff
- E. Cracks or loose joints in the sewer pipe
- F. None of the Above

255. Manholes themselves can also be _____ from cracks in the barrel of the manhole.

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Warm, moist, nutrient rich atmosphere
- E. Severity of I/I
- F. None of the Above

Tree Roots vs. Sanitary Sewer Lines-Root Growth in Pipes

256. Roots require oxygen to grow, they do not grow in _____ or where high ground water conditions prevail.

- A. Sanitary sewer service line
- B. Debris discharged
- C. Pipes that are full of water
- D. Exert considerable pressure
- E. Cracks or loose joints in the sewer pipe
- F. None of the Above

257. The flow of warm water inside the sanitary sewer service pipe causes water with _____ surrounding the pipe.

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Vapor to escape to the cold soil
- E. Severity of I/I
- F. None of the Above

258. Tree roots are attracted to the water vapor leaving the pipe and they follow the vapor trail to the source of the moisture, which are usually in?

- A. Sanitary sewer service line
- B. Debris discharged
- C. Rehabilitation program
- D. Exert considerable pressure
- E. Cracks or loose joints
- F. None of the Above

259. Upon reaching the crack or pipe joint, this term will penetrate the opening to reach the nutrients and moisture inside the pipe.

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Tree roots
- E. Severity of I/I
- F. None of the Above

Problems Caused by Roots Inside Sewers

260. Once inside the pipe, roots will continue to grow, and if not disturbed, they will completely fill the pipe with multiple hair-like root masses at each point of entry.

- A. True
- B. False

261. Homeowners will notice the first signs of _____ by hearing gurgling noises from toilet bowls and observing wet areas around floor drains after completing the laundry.

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Slow flowing drainage system
- E. Severity of I/I
- F. None of the Above

262. As roots continue to grow, they expand and exert considerable pressure _____ where they entered the pipe.

- A. Sanitary sewer service line
- B. Debris discharged
- C. Rehabilitation program
- D. At the crack or joint
- E. Cracks or loose joints in the sewer pipe
- F. None of the Above

263. Which of the following term and pipes that are structurally damaged will require replacement?

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Severe root intrusion
- E. Severity of I/I
- F. None of the Above

Tree Roots in Sewer

264. Roots from trees growing on private property and on parkways throughout the City are responsible for many of the sanitary sewer service backups and?

- A. Root intrusion
- B. Drought conditions
- C. Inflow and infiltration (I&I)
- D. Sanitary sewer service backup(s)
- E. Damaged sewer pipes
- F. None of the Above

265. The replacement cost of a sanitary sewer service line as a result of _____ may be very expensive.

- A. Root intrusion
- B. Damage from tree roots
- C. Tree roots
- D. Copper sulfate and sodium hydroxide
- E. The common method of removing roots
- F. None of the Above

Pipes Susceptible to Root Damage

266. Clay tile pipe that was commonly installed by developers and private contractors until the late 1980's is easily penetrated and?

- A. Root intrusion
- B. Drought conditions
- C. Inflow and infiltration (I&I)
- D. Sanitary sewer service backup(s)
- E. Damaged by tree roots
- F. None of the Above

267. The tightly fitting PVC joints are less likely to do this term as a result of settlement of backfill around the pipe.

- A. Root intrusion
- B. Sewer service
- C. Tree roots
- D. Leak
- E. The common method of removing roots
- F. None of the Above

Root Spread

268. During drought conditions and in winter, tree roots travel long distances in search of moisture, as a general rule, tree roots will extend up to 10 times the height of the tree.

- A. True
- B. False

Root Growth Control

269. The common method of removing roots from this term involves the use of augers, root saws, and high pressure flushers.

- A. Root intrusion
- B. Sewer service
- C. Sanitary sewer service pipes
- D. Sanitary sewer service backup(s)
- E. The common method of removing roots
- F. None of the Above

Smoking out Sewer Leaks

270. Used extensively for over 40 years, smoke testing has proven to be a vital ingredient of successful inflow and infiltration (I&I) studies. It is as important now as it has ever been, as growing municipalities increase demands on aging, often deteriorating collection systems.

- A. True
- B. False

271. Smoke travels throughout the system, identifying problems in all connected lines, even sections of line that were not known to exist, or thought to be independent or unconnected. Best results are obtained during dry weather, which allows smoke better opportunity to travel to the surface.

- A. True
- B. False

More on Manholes

272. When designing a wastewater system, the design engineer begins by first determining the amount of money that is available.

- A. True
- B. False

273. The design engineer bases his design on the average daily use of solids per person in the area to be served.

- A. True
- B. False

274. The average daily flow (based on the average utilization) is multiplied by a peak flow factor to obtain the?

- A. Design flow
- B. Peak flow factor
- C. A typical value
- D. Water per person in the area to be served
- E. A typical infiltration allowance
- F. None of the Above

Vacuum Lines

275. Which of the following terms are installed in narrow trenches in a saw tooth profile for grade and uphill transport?

- A. Vacuum sewer system(s)
- B. Lift station
- C. Downhill transport
- D. Vacuum pump(s)
- E. Vacuum service lines
- F. None of the Above

276. Unlike gravity sewers that must be laid at a minimum slope to obtain a 2 ft./sec. scouring velocity, vacuum has a flatter slope since a high scouring velocity is a feature of transporting?

- A. Raw sewage
- B. Vacuum sewage
- C. High scouring velocity
- D. Potential vacuum loss
- E. Vacuum pump(s)
- F. None of the Above

Line Sizes

277. The vacuum service line from this term to the main in the street is 3".

- A. Vacuum sewer system(s)
- B. Lift station
- C. Valve
- D. Vacuum pump(s)
- E. Vacuum service line
- F. None of the Above

Vacuum Station

278. The vacuum station is similar in function to a lift station in a gravity sewer system. Sewage pumps transfer the sewage from the?

- A. Vacuum sewer system(s)
- B. Lift station
- C. Collection tank
- D. Vacuum pump(s)
- E. Vacuum service line
- F. None of the Above

Vacuum Pumps

279. Which of the following terms typically run 2 to 3 hours each per day and don't need to run continuously since the vacuum interface valves are normally closed?

- A. Raw sewage
- B. Solids
- C. High scouring velocity
- D. Potential vacuum loss
- E. Vacuum pump(s)
- F. None of the Above

Review Pressure Sewers

280. Which of the following terms do not rely on gravity, the system's network of piping can be laid in very shallow trenches that follow the contour of the land?

- A. Gravity system
- B. Grinder pump(s)
- C. Pressure sewers
- D. Two kinds of pressure sewer systems
- E. Both the STEP and grinder systems
- F. None of the Above

Sewer Line Mapping

281. Which of the following terms and repairs are unlikely if mapping is not adequate?

- A. Overflow points
- B. Introduction of flows
- C. Inspection
- D. Owner or operator's management program
- E. Efficient collection system maintenance
- F. None of the Above

282. Collection system maps should have a numbering system which uniquely identifies all manholes and?

- A. Engineering endeavors
- B. Sewer line maps
- C. Sewer cleanouts
- D. Quality sanitary sewer designs
- E. Numbering system
- F. None of the Above

Grease

283. Which of the following terms due to grease build-up are a common cause of sanitary sewer overflows, and grease accumulation at treatment facilities can lead to pass-through of contaminants?

- A. Grease interceptor(s)
- B. POTW
- C. Notice of Violation
- D. Pass-through of contaminants
- E. Blockages
- F. None of the Above

284. Proactive municipal governments have a grease ordinance which provides them legal authority to require that grease generators have devices to catch the grease before it enters the public wastewater system, these devices are often referred to as?

- A. POTW(s)
- B. Local ordinance
- C. Grease interceptor(s)
- D. International Plumbing Code
- E. Grease traps
- F. None of the Above

285. Proactive municipal governments also have in place this term to ensure grease generators clean the traps on an appropriate schedule and in a proper manner.

- A. Grease interceptor(s)
- B. POTW
- C. Notice of Violation
- D. Pass-through of contaminants
- E. An inspection and enforcement program
- F. None of the Above

286. Which of the following terms have public education programs to ensure non-commercial contributions of grease to the wastewater system are minimized?

- A. Proactive municipalities
- B. Local ordinance
- C. Grease interceptor(s)
- D. International Plumbing Code
- E. POTW inspectors
- F. None of the Above

Grease Interceptors

287. Which of the following terms use grease interceptors which are larger than the traps and are installed underground, outside of a facility?

- A. Grease interceptor(s)
- B. High-volume or new establishments
- C. Notice of Violation
- D. Pass-through of contaminants
- E. An inspection and enforcement program
- F. None of the Above

288. Which of the following terms should be accessible by three manhole covers, and a sample box?

- A. Sewer
- B. Manhole
- C. Grease interceptor(s)
- D. Grease trap
- E. POTW sampling point
- F. None of the Above

Plan Checks and Inspections

289. All plans for new commercial food establishments should receive a plan review from the?

- A. Grease interceptor(s)
- B. POTW
- C. Notice of Violation
- D. Pass-through of contaminants
- E. An inspection and enforcement program
- F. None of the Above

Grease Blockages

290. A determination should be made as to which commercial facilities contributed to the blockage, and more in-depth inspections are conducted at those facilities. Where appropriate, additional requirements and/or procedures are put in place.

- A. True
- B. False

291. A Notice of Violation, with this term, is issued once a facility has passed its final due date.

- A. Grease interceptor(s)
- B. POTW
- C. An administrative fee
- D. Pass-through of contaminants
- E. An inspection and enforcement program
- F. None of the Above

Collection Systems O&M Section
Sewer Cleaning and Inspection

292. As sewer system networks age, the risk of deterioration, this missing term, and collapses becomes a major concern.

- A. Sanitary sewer overflow(s)
- B. Rehabilitation
- C. Blockages
- D. Check with the local authorities
- E. Education and pollution prevention
- F. None of the Above

293. Which of the following terms are essential to maintaining a properly functioning system; these activities further a community's reinvestment into its wastewater infrastructure?

- A. Inspection technique(s)
- B. CCTV inspection(s)
- C. Inspection program(s)
- D. Visibility of manholes and other structures
- E. Cleaning and inspecting sewer lines
- F. None of the Above

Inspection Techniques

294. Which of the following terms are required to determine current sewer conditions and to aid in planning a maintenance strategy?

- A. Documentation of inspections
- B. CCTV inspection(s)
- C. Visual inspection(s)
- D. Cleaning and inspecting sewer lines
- E. Inspection programs
- F. None of the Above

Most sewer lines are inspected using one or more of the following techniques:

295. Which of the following terms are the most frequently used most cost efficient in the long term, and most effective method to inspect the internal condition of a sewer?

- A. Grade 1 operator
- B. Lamping
- C. Inspection program(s)
- D. Television (TV) inspections
- E. Polaroid still photographs
- F. None of the Above

296. Which of the following terms are recommended for sewer lines with diameters of 4 - 48 inches?

- A. Lining
- B. Rehabilitation
- C. CCTV inspection(s)
- D. Eyeballing
- E. Rodding
- F. None of the Above

297. To see details of the sewer walls, the camera and lights should swivel both vertically and horizontally.

- A. True
- B. False

298. Which of the following terms in smaller sewers are attached to a sled, to which a parachute or droge is attached and floated from one manhole to the next?

- A. Cable box
- B. Slick
- C. Kite
- D. Sewer boat
- E. The cable and camera
- F. None of the Above

Cleaning Techniques

299. A sewer system needs a cleaning schedule, there are several traditional cleaning techniques used to clear blockages and to act as?

- A. Sanitary sewer overflow(s)
- B. Rehabilitation
- C. CCTV inspection(s)
- D. Preventative maintenance tools
- E. Education and pollution prevention
- F. None of the Above

300. When you are cleaning sewer lines, your local community need to be aware of EPA regulations on solid and hazardous waste as defined in 40 CFR 261.

- A. True
- B. False

301. The ideal method of reducing and controlling the materials found in sewer lines is education and?

- A. Sanitary sewer overflow(s)
- B. Rehabilitation
- C. CCTV inspection(s)
- D. Pollution prevention
- E. Maintaining sewer systems
- F. None of the Above

Lamping Inspection

302. Which of the following terms is only able to inspect the first 10 feet of the pipe?

- A. Bucketing
- B. Rodding
- C. Rehabilitation
- D. Sewer line cleaning
- E. Lamping
- F. None of the Above

303. According to the text, older areas of the sewer system are inspected every four years; whereas, the inspection of relatively new areas may be completed in 1 to 2 years.

- A. True
- B. False

Cleaning Method Limitation

304. Balling - Balling cannot be used effectively in pipes with _____ or protruding service connections because the ball can become distorted.

- A. Steep-grade hill areas
- B. Backups into residences
- C. Variety of cleaning methods
- D. Completely plugged
- E. Bad offset joints
- F. None of the Above

305. Which of the following terms cleaning larger lines, the manholes need to be designed to a larger size in order to receive and retrieve the equipment?

- A. Bucket machine(s)
- B. Jetting
- C. Chemicals' effectiveness
- D. Scooter
- E. Kite or Bag
- F. None of the Above

306. Bucket Machine- This device has been known to damage sewers and the set-up of this equipment is?

- A. Good for steep-grade hill areas
- B. Able to backups into residences
- C. Able for a variety of cleaning methods
- D. Time-consuming
- E. Not effectively remove sand or grit
- F. None of the Above

Limitations of Cleaning Methods

307. Most of collection inspections use?

- A. Visual inspection(s)
- B. CCTV system
- C. Chemicals' effectiveness
- D. Flush and vacuum systems
- E. The cleaning and inspection crews
- F. None of the Above

Chapter 5 – Wastewater/Septage Composition Section

Organic Matter

308. Two toxic _____ like benzene and toluene are found in some solvents, pesticides, and other products.

- A. Nutrients from wastewater
- B. Inorganic materials
- C. Inorganic minerals
- D. Excessive grease
- E. Organic compounds
- F. None of the Above

Oil and Grease

309. Which of the following wastewater terms also adds to the septic tank scum layer, causing more frequent tank pumping to be required?

- A. Nutrients from wastewater
- B. Inorganic materials
- C. Inorganic minerals
- D. Excessive grease
- E. Nitrogen and phosphorus
- F. None of the Above

Inorganics

310. According to the text, heavy metals can be discharged with many types of industrial wastewaters are difficult to remove by conventional treatment methods.

- A. True
- B. False

311. Which of the following wastewater terms - metals, and compounds, such as sodium, potassium, calcium, magnesium, cadmium, copper, lead, nickel, and zinc are common in wastewater from both residential and nonresidential sources?

- A. Nutrients from wastewater
- B. Inorganic materials
- C. Inorganic minerals
- D. Excessive grease
- E. Pesticides and herbicide(s)
- F. None of the Above

Nutrients

312. Normally, excessive nutrients in receiving waters cause algae and other plants to grow quickly adding oxygen in the water, because of this additional of oxygen, fish and other aquatic life thrive.

- A. True
- B. False

Solids

313. Which of the following terms must be treated, or they will clog soil absorption systems or reduce the effectiveness of disinfection systems?

- A. BOD
- B. Organic material
- C. The solids
- D. Microorganisms
- E. Suspended solids in wastewater
- F. None of the Above

Gases

314. Methane gas is a byproduct of this wastewater term and is highly combustible.

- A. Dissolved oxygen
- B. Oxygen-demanding
- C. Magnesium hydroxide
- D. Biochemical oxygen demand or BOD
- E. Anaerobic biological treatment
- F. None of the Above

Hydrogen Sulfide and Ammonia

315. The gases hydrogen sulfide and along with this substance can be toxic and pose asphyxiation hazards.

- A. Ammonia
- B. Wastewater odor(s)
- C. Hydrogen sulfide or H₂S problem(s)
- D. The lack of oxygen
- E. Less oxygen
- F. None of the Above

316. Ammonia as a dissolved gas in wastewater also is not dangerous to fish.

- A. True
- B. False

Pollutants, Oxygen-Demanding Substances

317. Oxygen-demanding substances are usually destroyed or converted to other compounds by this term if there is sufficient oxygen present in the water.

- A. Dissolved oxygen
- B. Oxygen-demanding
- C. Magnesium hydroxide
- D. Biochemical oxygen demand, or BOD
- E. Bacteria
- F. None of the Above

Pathogens

318. According to the text, modern disinfection techniques have greatly reduced the danger of waterborne disease.

- A. True
- B. False

Nutrients

319. Which of the following wastewater terms - are essential to living organisms and are the chief nutrients present in natural water?

- A. Oxygen
- B. Ecology
- C. Nutrient enrichment
- D. Carbon, nitrogen, and phosphorus
- E. Phosphorus and nitrogen
- F. None of the Above

320. Uncontrolled algae growth blocks out sunlight and chokes aquatic plants and animals by depleting _____ in the water at night.

- A. Pathogen(s)
- B. Dissolved oxygen
- C. Nutrient enrichment
- D. Excessive growth of algae
- E. Phosphorus and nitrogen
- F. None of the Above

321. According to the text, the release of nutrients in quantities that exceed the affected waterbody's ability to assimilate them results in a condition called?

- A. Toxic
- B. Ecology
- C. Nutrient enrichment
- D. Eutrophication or cultural enrichment
- E. Oxygen and organic waste
- F. None of the Above

322. Which of the following wastewater terms - do not remove the phosphorus and nitrogen to any substantial extent?
- A. Biofilm
 - B. Some contaminants
 - C. Secondary treatment
 - D. Conventional secondary biological treatment processes
 - E. Oxygen and organic waste
 - F. None of the Above

Chapter 6 – SCADA Introduction

323. Industrial organizations and companies in the public and private sectors to maintain and control efficiency, distribute data for smarter decisions, and communicate system issues to help mitigate downtime utilize SCADA systems.

- A. True
- B. False

324. SCADA systems are critical for industrial organizations (like water and wastewater facilities) since they help to maintain efficiency, process data for smarter decisions, and communicate system issues to help mitigate downtime.

- A. True
- B. False

325. The SCADA software will process, distribute, and display important data, helping operators and other employees understand the data and make important decisions.

- A. True
- B. False

326. The acronym SCADA refers to the centralized computer systems that control and monitor the entire sites, or they are the complex systems spread out over large areas. Nearly all the control actions are automatically performed by the remote terminal units (RTUs) or by the programmable logic controllers (PLCs).

- A. True
- B. False

327. Data acquisition starts at the HMI level, which includes the equipment status reports, and meter readings. Data is then formatted in such way that the operator of the control room can make the supervisory decisions to override or adjust normal HMI controls, by using the PLC.

- A. True
- B. False

328. SCADA systems implement the distributed databases known as Excel databases, containing data elements called rows or columns.

- A. True
- B. False

329. The key attribute of a SCADA system is its capability to perform a supervisory operation over a variety of other proprietary devices.

- A. True
- B. False

330. The internet is linked to the SCADA system's databases, to provide the diagnostic data, management information and trending information such as logistic information, detailed schematics for a certain machine or sensor, maintenance procedures and troubleshooting guides.

- A. True
- B. False

331. Which of the following terms can convert electrical signals coming from the equipment into digital values like the status- open/closed – from a valve or switch, or the measurements like flow, pressure, current or voltage?

- A. RTU
- B. HMI
- C. PLC
- D. None of the Above

332. By converting and sending the electrical signals to the equipment, _____ may control the equipment, like closing or opening a valve or a switch, or setting the speed of the pump.

- A. RTU
- B. HMI
- C. SCADA system
- D. None of the Above

333. A 'supervisory Station' refers to the software and servers responsible for communication with the field equipment (PLCs, RTUs etc.), and after that, to _____ software running on the workstations in the control room, or somewhere else.

- A. RTU
- B. HMI
- C. SCADA system
- D. None of the Above

334. Which of the following terms can have multiple servers, disaster recovery sites and distributed software applications in larger SCADA systems?

- A. Master station
- B. SCADA implementation(s)
- C. SCADA system(s)
- D. None of the Above

335. For increasing the system integrity, _____ are occasionally configured in hot standby or dual-redundant formation, providing monitoring and continuous control during server failures.

- A. Multiple servers
- B. Independent systems
- C. Multiple stations
- D. None of the Above

336. Which of the following terms originally used modem connections or combinations of direct and radio serial to meet communication requirements, even though IP and Ethernet over SONET/SDH can also be used at larger sites like power stations and railways?

- A. SCADA systems
- B. SCADA implementation(s)
- C. SCADA
- D. None of the Above

337. The monitoring function or remote management of the _____ is referred to as telemetry.

- A. SCADA operator
- B. SCADA implementation(s)
- C. SCADA system(s)
- D. None of the Above

338. An important part of most SCADA implementations is _____. The system monitors whether certain alarm conditions are satisfied, to determine when an alarm event has occurred.

- A. Policies and procedures
- B. The cyber security team
- C. Alarm handling
- D. None of the Above

339. Once an alarm event has been detected, one or more actions are taken (such as the activation of one or more alarm indicators, and perhaps the generation of email or text messages so that management or _____ are informed).

- A. SCADA operator
- B. SCADA implementation(s)
- C. Remote SCADA operators
- D. None of the Above

340. In many cases, a _____ may have to recognize the alarm event; this may deactivate some alarm indicators, whereas other indicators remain active until the alarm conditions are cleared.

- A. SCADA operator
- B. SCADA implementation(s)
- C. SCADA
- D. None of the Above

341. Which of the following terms might automatically monitor whether the value in an analogue point lies outside high and low- limit values associated with that point?

- A. SCADA operator
- B. SCADA implementation(s)
- C. SCADA system(s)
- D. None of the Above

342. Which of the following terms translates the electrical signals from the equipment to digital values such as the open/closed status from a switch or a valve, or measurements such as pressure, flow, voltage or current? By translating and sending these electrical signals out to equipment the RTU can control equipment, such as opening or closing a switch or a valve, or setting the speed of a pump.

- A. RTU
- B. HMI
- C. PLCs
- D. None of the Above

343. In the first production, mainframe systems were used for computing. At the time SCADA was established, networks did not exist. Therefore, the _____ did not have any connectivity to other systems, meaning they were independent systems.

- A. SCADA systems
- B. Independent systems
- C. Multiple stations
- D. None of the Above

344. The information between multiple stations was shared in real time through _____ and the processing was distributed between various multiple stations. The cost and size of the stations were reduced in comparison to the ones used in the first generation.

- A. RTU
- B. HMI
- C. LAN
- D. None of the Above

345. The interaction between the system and the master station is done through the WAN protocols like the _____.

- A. Internet Protocols (IP)
- B. Common IT practices
- C. Remote or distant operation
- D. None of the Above

346. Since the standard protocols used and the _____ can be accessed through the internet, the vulnerability of the system is enlarged.

- A. Networked SCADA systems
- B. SCADA implementation(s)
- C. SCADA system(s)
- D. None of the Above

347. SCADA systems are now in line with the standard networking technologies. The old proprietary standards are being replaced by the _____. However, due to certain characteristics of frame-based network communication technology, Ethernet networks have been recognized by the majority of markets for HMI SCADA.

- A. ICS network
- B. LAN to a WAN
- C. TCP/IP and Ethernet protocols
- D. None of the Above

348. There are many threat vectors to a modern SCADA system. One is the threat of unauthorized access to the control software, whether it is human access or changes induced intentionally or accidentally by _____ residing on the control host machine.

- A. Policies and procedures
- B. DoS attacks and malware
- C. Virus infections and other software threats
- D. None of the Above

349. In many cases, SCADA users have assumed that having a VPN offered sufficient protection, unaware that security can be _____ to SCADA-associated network jacks and switches.

- A. Different risks and priorities
- B. Significantly less isolation
- C. Trivially bypassed with physical access
- D. None of the Above

Chapter 7 -Safety Section

Confined Space Entry Program-Purpose

350. The Confined Space Entry Program is provided to protect authorized employees that will enter confined spaces from safety or health hazards associated with confined spaces.

- A. True
- B. False

Scope

351. According to the text, you are required to recognize _____ associated with confined spaces.

- A. Internal configurations
- B. Hazardous atmospheres
- C. Permit-Required Confined Spaces
- D. The dangers and hazards
- E. Atmospheric factors and physical agents
- F. None of the Above

Definitions

Confined space:

352. A confined space is large enough or so configured that an employee can _____.

- A. Have sufficient oxygen
- B. Bodily enter and perform work
- C. See the internal configuration
- D. Recognize serious safety or health hazards
- E. Continuously occupy the space
- F. None of the Above

353. A confined space has limited or restricted means for _____.

- A. An internal configuration
- B. Hazardous atmosphere
- C. A safe working environment
- D. Entry or exit
- E. Atmospheric factors and physical agents
- F. None of the Above

354. A confined space is not designed for _____.

- A. Engulfing an entrant
- B. Hazardous atmospheres
- C. An internal configuration
- D. Recognized serious safety or health hazards
- E. Continuous employee occupancy
- F. None of the Above

355. A permit required confined space (permit space) contains or has a potential to contain a _____.

- A. Recognized internal configuration
- B. Hazardous atmosphere
- C. Permit-Required Confined Space
- D. Entry or exit
- E. Physical agent
- F. None of the Above

356. A permit required confined space (permit space) contains a material that has _____.

- A. Authorized entrants
- B. Hazardous atmospheres
- C. The potential for engulfing an entrant
- D. Serious safety or health hazards
- E. Continuous employee occupancy
- F. None of the Above

357. A permit required confined space (permit space) has an internal configuration such that _____ could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.

- A. An internal configuration
- B. Hazardous atmosphere
- C. Equipment
- D. An entrant
- E. Atmospheric factors and physical agents
- F. None of the Above

358. A permit required confined space (permit space) contains any other recognized serious safety or _____.

- A. Engulfing an entrant
- B. Hazardous atmospheres
- C. Internal configuration
- D. Health hazard
- E. Continuous employee occupancy
- F. None of the Above

359. Each _____ must be marked "Confined Space - Entry Permit Required".

- A. Internal configuration
- B. Hazardous atmosphere
- C. Permit-Required Confined Space
- D. Entry or exit
- E. Atmospheric factor and physical agent
- F. None of the Above

Confined Space Hazards

360. Fatalities and injuries constantly occur among construction workers who are required to enter _____.

- A. An internal configuration
- B. Hazardous atmosphere
- C. Ventilation ducts
- D. Trenches
- E. Confined spaces
- F. None of the Above

361. Workers encounter both inherent and _____ within confined workspaces.

- A. An internal configuration
- B. Hazardous atmosphere
- C. Permit-Required Confined Spaces
- D. Induced hazards
- E. Atmospheric factors and physical agents
- F. None of the Above

Inherent Hazards

362. _____ are associated with specific types of equipment and the interactions among them. These hazards can be electrical, thermal, chemical, mechanical, etc.

- A. Inherent hazards
- B. Hazardous atmospheres
- C. Internal configurations
- D. Recognized serious safety or health hazards
- E. Continuous employee occupancies
- F. None of the Above

363. Inherent hazards include high voltage, radiation generated by equipment, _____, omission of protective features, high or low temperatures, high noise levels, and high-pressure vessels and lines.

- A. An internal configuration
- B. Hazardous atmosphere
- C. Permit-Required Confined Spaces
- D. Defective design
- E. Atmospheric factors and physical agents
- F. None of the Above

364. Inherent hazards usually cannot be eliminated without degrading or shutting down the system or equipment. Therefore, emphasis must be placed on _____.

- A. Hazard control methods
- B. Hazardous atmospheres
- C. Internal configurations
- D. Recognized serious safety or health hazards
- E. Continuous employee occupancy
- F. None of the Above

Induced Hazards

365. _____ result from a multitude of incorrect decisions and actions that occur during the actual construction process.

- A. Induced hazards
- B. Below-grade locations
- C. Vibrations
- D. Build-up of explosive gases
- E. Oxygen-deficient atmospheres
- F. None of the Above

366. Some examples of induced hazards are: omission of protective features, physical arrangements that may cause unintentional worker contact with electrical energy sources, oxygen-deficient atmospheres created at the bottom of pits or shafts, lack of safety factors in structural strength, and _____.

- A. Common confined spaces
- B. Hazards
- C. Vaults
- D. Extreme temperatures
- E. Flammable atmospheres
- F. None of the Above

Typical Examples of Confined Workspaces

367. Confined workspaces in construction contain _____.

- A. Purging agents
- B. Below-grade location
- C. Vibration
- D. Both inherent and induced hazards
- E. Pollution
- F. None of the Above

Vaults

368. Workers must enter _____ found on the construction jobsite to perform a number of functions.

- A. Common confined spaces
- B. Hazards
- C. A variety of vaults
- D. Oxygen-deficient atmospheres
- E. Low-voltage systems
- F. None of the Above

369. The restricted nature of vaults and their frequently _____ are reasons that vaults have an assortment of safety and health problems.

- A. Purged atmosphere
- B. Below-grade location
- C. Above-ground location
- D. Explosive atmosphere
- E. Oxygen-deficient atmosphere
- F. None of the Above

Oxygen-Deficient Atmosphere

370. The ever-present possibility of _____ is one of the major problems confronting construction workers while working in vaults.

- A. A common confined space
- B. Hazards
- C. Vaults
- D. An oxygen-deficient atmosphere
- E. Low-voltage systems
- F. None of the Above

Explosive or Toxic Gases, Vapors, or Fumes

371. _____ produce toxic fumes which are confined in the limited atmosphere of a confined space.

- A. Purging agents
- B. Below-grade locations
- C. Welding and soldering
- D. Build-up of explosive gases
- E. Oxygen-deficient atmospheres
- F. None of the Above

Electrical Shock

372. _____ results because the contractor has not provided an approved grounding system or the protection afforded by ground-fault circuit interrupters or low-voltage systems.

- A. Common confined space
- B. Hazard
- C. Electrical shock
- D. An oxygen-deficient atmosphere
- E. A low-voltage system
- F. None of the Above

Purging

373. Purging agents such as nitrogen and argon may enter a vault from adjacent areas. These agents may displace the oxygen in the vault and asphyxiate workers almost immediately.

- A. True
- B. False

Materials Falling In and On

374. According to the text, a _____ normally considered a problem associated with confined spaces is material or equipment which may fall into the vault.

- A. Common confined space
- B. Hazard
- C. Vault
- D. Oxygen-deficient atmosphere
- E. Rare occurrence
- F. None of the Above

375. If the _____ were removed, materials could fall into the vault, causing injury to the workers inside.

- A. Purging agents
- B. Below-grade locations
- C. Manhole covers
- D. Explosive gases
- E. Oxygen-deficient atmospheres
- F. None of the Above

Condenser Pits

376. Because of their large size, condenser pits found in the construction of nuclear power plants are often overlooked as _____.

- A. Common confined spaces
- B. Hazards
- C. Vaults
- D. Oxygen-deficient atmospheres
- E. Potentially hazardous confined spaces
- F. None of the Above

377. Condenser pits create large containment areas for the accumulation of toxic fumes and gases, or for the creation of _____ when purging with argon, Freon, and other inert gases.

- A. Purging agents
- B. Below-grade locations
- C. Vibrations
- D. Build-up of explosive gases
- E. Oxygen-deficient atmospheres
- F. None of the Above

378. Workers above will create other _____ by dropping equipment, tools, and materials into the condenser pit.

- A. Hazards
- B. Collection places
- C. Heat sources
- D. Problems with the pumps
- E. Oxygen deficiencies
- F. None of the Above

Manholes

379. Manholes are necessary to provide a means of entry into and exit from vaults, tanks, and pits, but these confined spaces may present _____ which could cause injuries and fatalities.

- A. Electrical shock
- B. Ventilation ducts
- C. Serious hazards
- D. Welding fumes
- E. Sumps
- F. None of the Above

380. _____ are associated with manholes. For example, workers could fall into manholes when covers are missing.

- A. Nitrogen purges
- B. Collection places
- C. A variety of hazards
- D. Problems with the pumps
- E. Oxygen deficiencies
- F. None of the Above

Tanks

381. Tanks are _____ that are used for a variety of purposes, including the storage of water and chemicals.

- A. Nitrogen purge locations
- B. Collection places
- C. Vaults
- D. Another type of confined workspace
- E. Sumps
- F. None of the Above

382. According to the text, oxygen-deficient atmospheres, along with toxic and explosive atmospheres created by the substances stored in the tanks, present hazards to workers.

- A. True
- B. False

383. Heat in tanks may cause _____, particularly on a hot day.

- A. Toxic fumes
- B. Equipment failure
- C. Heat prostration
- D. Problems with pumps
- E. Oxygen deficiency
- F. None of the Above

384. The _____ often requires workers to climb ladders to reach high places on the walls of the tank.

- A. Electrical shock potential
- B. Ventilation duct
- C. Confined workspace
- D. Nature of the tank's structure
- E. Sump
- F. None of the Above

Sumps

385. Workers may encounter _____ when entering sumps.

- A. Nitrogen purge or dry air
- B. An oxygen-deficient atmosphere
- C. Heat prostration
- D. Problems with pumps
- E. Construction debris
- F. None of the Above

386. Because of the wet nature of the sump, the use of power tools inside may create _____ hazards.

- A. Electrical shock
- B. Inadequate lighting
- C. Confined workspace
- D. Tripping
- E. Falling
- F. None of the Above

Unusual Conditions

Confined Space within a Confined Space

387. One of the most hazardous confined spaces of all is a confined space within a confined space.

- A. True
- B. False

388. The _____ associated with the outer confined space and those of the inner confined space both require testing, monitoring, and control.

- A. Pumps
- B. Access passages
- C. Pits or vessels
- D. Manholes
- E. Potential hazards
- F. None of the Above

389. Often, only the outer space is evaluated for potential hazards. Workers are also faced with _____ when they enter the inner space.

- A. Poor lighting
- B. Excavations
- C. Smaller work areas
- D. Potentially hazardous conditions
- E. Construction debris
- F. None of the Above

390. Workers entering a vessel inside an access pit should do so only after both spaces have been evaluated and _____.

- A. Purged
- B. Accessed
- C. Opened
- D. Confined spaces eliminated
- E. Proper control measures established
- F. None of the Above

Hazards in One Space Entering another Space

391. According to the text, during an examination of _____, situations are often encountered which are not always easy to evaluate or control.

- A. Tanks
- B. Excavations
- C. Vaults
- D. Work areas
- E. Confined spaces in construction
- F. None of the Above

392. A room which classifies as a confined space may be relatively safe for work. However, access passages from other areas outside or adjacent to the room could, at some point, allow the transfer of _____ into the "safe" room.

- A. Noise
- B. Equipment and tools
- C. Vibrations
- D. Unauthorized workers
- E. Hazardous agents
- F. None of the Above

393. Welding fumes and other _____ generated in one room may easily travel through a pipe into another area, causing that area to change from a safe to an unsafe workplace.

- A. Toxic materials
- B. Construction debris
- C. Dust and dirt
- D. Noise
- E. Problems
- F. None of the Above

394. In a situation where hazards in one space may enter another, a serious problem is that workers working in the "safe" area are not aware of the _____.

- A. Oxygen Level
- B. Access passages
- C. Pit and/or the vessel
- D. Confined space
- E. Hazards leaking into their area
- F. None of the Above

Permitted Confined Space Entry Program

395. According to the text, all trenches are _____.

- A. Too narrow for work
- B. Access passages
- C. Permit-required
- D. Safe for short term work
- E. Excavations
- F. None of the Above

396. According to the text, all excavations are _____.

- A. Permit-required
- B. Not trenches
- C. Workspaces
- D. Access passages
- E. Safe for short term work
- F. None of the Above

Permit Required Confined Space Entry General Rules

397. According to the text, only authorized and trained employees may enter a _____ or act as safety watchmen/attendants.

- A. Hazard
- B. Pipe
- C. Pit or vessel
- D. Confined space
- E. Jobsite
- F. None of the Above

398. Employees are not permitted to smoke _____ or near the entrance/exit area.

- A. Near air and oxygen monitors
- B. During a side entry
- C. In a confined space
- D. Unless permitted
- E. For 8 hours
- F. None of the Above

399. A watchmen or attendant must be present at all times during _____.

- A. Hazards
- B. Access passages
- C. Construction
- D. Air monitoring
- E. Confined space entries
- F. None of the Above

400. Air and oxygen monitoring will check the levels of oxygen, explosive gasses, and carbon monoxide. Entry will not be permitted if explosive gas is detected above one-half the _____.

- A. Nitrogen level
- B. Argon level
- C. Freon level
- D. Lower Explosive Limit (LEL)
- E. Oxygen limit
- F. None of the above.