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State Approval Listing Link, check to see if your State accepts or has pre-approved this course. Not all States are listed. Not all courses are listed. If the course is not accepted for CEU credit, we will give you the course free if you ask your State to accept it for credit.

Professional Engineers; Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval or acceptance.

State Approval Listing URL...

<http://www.tlch2o.com/PDF/CEU%20State%20Approvals.pdf>

You can obtain a printed version of the course manual from TLC for an additional \$79.95 plus shipping charges.

AFFIDAVIT OF EXAM COMPLETION

I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

Grading Information

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

Rush Grading Service

If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

Distribution Advanced Answer Key

Name _____

Phone _____

Please Circle, Bold, Underline or X, one answer per question.

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Backup Fax (928) 468-0675 Always call us after faxing the paperwork to ensure that we've received it.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Please e-mail or fax this survey along with your final exam

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2. Please rate the difficulty of the testing process.
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3. Please rate the subject matter on the exam to your actual field or work.
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Any other concerns or comments.

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The Distribution Advanced CEU course assignment is available in Word on the Internet for your convenience, please visit www.ABCTLIC.com and download the assignment and e-mail it back to TLC.

You will have 90 days from receipt of this manual to complete it in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % or better is necessary to pass this course. If you should need any assistance, please email or fax all concerns and the completed **ANSWER KEY** to info@tlch2o.com.

Select one answer per question. Please utilize the answer key.

Safety Section

Excavation & Trenching

1. This section outlines procedures and guidelines for the _____ working in and around excavations and trenches. This section requires compliance with OSHA Standards described in Subpart P (CFR 1926.650) for the construction industry.
 - A. Employee protection or protection of employees
 - B. Competent person(s)
 - C. Excavation workers
 - D. Registered professional engineer
 - E. None of the Above

2. Safety compliance is mandatory to ensure _____ when working in or around excavations.
 - A. Employee protection or protection of employees
 - B. Competent person(s)
 - C. Excavation workers
 - D. Registered professional engineer
 - E. None of the Above

3. The _____ must be trained in accordance with the OSHA Excavation Standard, and all other programs that may apply (examples Hazard Communication, Confined Space, and Respiratory Protection), and must demonstrate a thorough understanding and knowledge of the programs and the hazards associated.
 - A. Employee protection or protection of employees
 - B. Competent person(s)
 - C. Excavation workers
 - D. Registered professional engineer
 - E. None of the Above

4. All other employees working in and around the _____ must be trained in the recognition of hazards associated with trenching and excavating.
 - A. Construction
 - B. Job site
 - C. Excavation
 - D. Spoil pile
 - E. None of the Above

5. One of the reasons OSHA requires a(n) _____ on-site during excavation & trenching are the numerous potential hazardous that may be encountered or created.
- A. Employee protection or protection of employees
 - B. Competent person(s)
 - C. Excavation expert
 - D. Registered professional engineer
 - E. None of the Above

Hazard Controls

6. All overhead hazards (surface encumbrances) that create a(n) _____ must be removed or supported to eliminate the hazard.

- A. Concern
- B. Safety issue
- C. Hazard to employees
- D. Dilemma
- E. None of the Above

7. If the excavation is to be over 20 feet deep, it must be designed by a(n) _____ who is registered in the state where work will be performed.

- A. Professional excavator
- B. Competent person(s)
- C. Excavation expert
- D. Registered professional engineer
- E. None of the Above

8. Before any work is performed and before any employees enter the _____, a number of items must be checked and ensured:

- A. Employee protection area
- B. Work zone
- C. Excavation
- D. Safety area
- E. None of the Above

9. Before any excavation, underground installations must be determined. This can be accomplished by either contacting the local utility companies or the _____ for the area. All underground utility locations must be documented on the proper forms.

- A. OSHA office
- B. State Agency
- C. Local "one-call" center
- D. Registered professional engineer
- E. None of the Above

10. Adequate protective systems will be utilized to _____. This can be accomplished through sloping, shoring, or shielding.

- A. Protect employees
- B. Hold back spoil
- C. Expedite excavation
- D. Hold utilities
- E. None of the Above

11. The worksite must be analyzed in order to design adequate protection systems and prevent _____.

- A. Spoil piles
- B. Cave-ins
- C. Excavation mishaps
- D. Access and egress
- E. None of the Above

12. No employee will work in a(n) _____ where water is accumulating unless adequate measures are used to protect the employees.

- A. Spoil pile
- B. Worksite
- C. Excavation
- D. Construction zone
- E. None of the Above

13. There must also be a(n) _____ safety plan developed to protect employees.

- A. Hazard
- B. Worksite
- C. Excavation
- D. Access and egress
- E. None of the Above

14. Workers must be supplied with and wear any personal protective equipment deemed necessary to assure their _____.

- A. Uniform looks appropriate
- B. Worksite security
- C. Protection
- D. Access and egress to the fashion show
- E. None of the Above

15. All spoil piles will be stored a minimum of two (2) feet from the sides of the excavation. The spoil pile must not block the safe means of _____.

- A. Rescue work
- B. Worksite construction
- C. Excavation backfilling
- D. Egress
- E. None of the Above

16. If a trench or excavation is 4 feet or deeper, stairways, ramps, or ladders will be used as a safe means of access and egress. For trenches, the employee must not have to _____ than 25 feet of lateral travel to reach the stairway, ramp, or ladder.

- A. Move spoil piles
- B. Work
- C. Excavate
- D. Travel any more
- E. None of the Above

17. A competent person will inspect all excavations and trenches daily, prior to employee exposure or entry, and after any rainfall, soil change, or any other time needed during the shift. The competent person must take prompt measures to _____.

- A. Create small spoil piles
- B. Making a clean worksite
- C. Excavate properly
- D. Eliminate any and all hazards
- E. None of the Above

18. Excavations and trenches 4 feet or deeper that have the potential for toxic substances or hazardous atmospheres will be tested at least daily. If the _____, protective systems will be utilized.

- A. Atmosphere is inadequate
- B. Worksite is wet
- C. Excavation is in type A soil
- D. Access and egress is good
- E. None of the Above

19. If work is in or around traffic, employees must be supplied with and wear orange reflective vests. Signs and barricades must be utilized to _____, vehicular traffic, and pedestrians.

- A. Make ramps on spoil piles
- B. Drive vehicles in to trenches
- C. Provide proper excavation
- D. Ensure the safety of employees
- E. None of the Above

Competent Person Responsibilities

20. The OSHA Standards require that the competent person must be _____ existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and have authorization to take prompt corrective measures to eliminate them and, if necessary, to stop the work.

- A. Dangerous
- B. Conducting all air monitoring
- C. Capable of identifying
- D. Conducting daily and periodic inspections
- E. None of the Above

A competent person is required to:

21. _____ (sloping, shoring, or shielding systems) for employee protection.

- A. Determine adequate protective systems
- B. Conduct all air monitoring
- C. Assure the proper locations
- D. Conduct daily and periodic inspections
- E. None of the Above

22. _____ for potential hazardous atmospheres.

- A. Smell the area
- B. Conduct all air monitoring
- C. Assure the proper locations from measuring
- D. Conduct daily and periodic inspections
- E. None of the Above

23. _____ of excavations and trenches.

- A. Identify dangers to employees
- B. Conduct all air monitoring
- C. Assure the proper locations
- D. Conduct daily and periodic inspections
- E. None of the Above

24. Have a complete understanding of the _____ and any other data provided.

- A. Dangerous stuff
- B. Air monitoring
- C. Proper locations
- D. Applicable safety standards
- E. None of the Above

25. _____ of underground installations or utilities, and that the proper utility companies have been contacted.

- A. Employees
- B. Conduct all air monitoring
- C. Assure the proper locations
- D. Conduct daily and periodic inspections
- E. None of the Above

26. _____ and reclassify soil after any condition changes.

- A. Examine
- B. Conduct soil classification tests
- C. Assure the proper locations
- D. Conduct daily and periodic inspections
- E. None of the Above

Excavation Safety Plan

27. An excavation safety plan is required in written form. This plan is to be developed to the level necessary to ensure complete compliance with the _____, state and local safety standards.

- A. OSHA Excavation Safety Standards
- B. Appendix A of the Standard
- C. Type A
- D. Exclusions
- E. None of the Above

28. Proper adherence to all _____, this excavation and trenching safety program, and any other coinciding safety programs.

- A. OSHA Standards
- B. Appendix A of the Standard
- C. Type A soils rules
- D. Exclusions
- E. None of the Above

Soil Classification and Identification

29. The _____ define soil classifications within the Simplified Soil Classification Systems, which consist of four categories: Stable rock, Type A, Type B, and Type C.

- A. OSHA Standards
- B. Appendix A of the Standard
- C. Type A
- D. Exclusions
- E. None of the Above

30. Stability is greatest in stable rock and decreases through _____ and B to Type C, which is the least stable.

- A. OSHA Standards
- B. Appendix A of the Standard
- C. Type A
- D. Exclusions
- E. None of the Above

31. _____ provides soil mechanics terms and types of field tests used to determine soil classifications.

- A. OSHA Standards
- B. Appendix A of the Standard
- C. Type A
- D. Exclusions
- E. None of the Above

32. _____ is defined as natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

- A. Stable rock
- B. Type A
- C. Type B
- D. Type C
- E. None of the Above

Type A soil is defined as:

33. _____ with an unconfined compressive strength of 1.5 tons per square foot (TSF) or greater.

- A. Cohesive soils
- B. Granular soils
- C. Submerged soil
- D. Submerged rock
- E. None of the Above

34. Cemented soils like caliche and hardpan are considered _____.

- A. Stable rock
- B. Type A
- C. Type B
- D. Type C
- E. None of the Above

Soil is NOT Type A if:

35. It is _____ or the soil is subject to vibration from heavy traffic, pile driving or similar effects.

- A. Cohesive soil
- B. Granular soils
- C. Submerged soil
- D. Submerged rock
- E. None of the Above

36. The material is subject to other factors that would require it to be classified as a less

- _____.
- A. Cohesive soil
 - B. Granular soils
 - C. Submerged soil
 - D. Submerged rock
 - E. None of the Above

37. The exclusions for _____ most generally eliminate it from most construction situations.

- A. Stable rock
- B. Type A
- C. Type B
- D. Type C
- E. None of the Above

Type B soil is defined as:

38. _____ with an unconfined compressive strength greater than .5 TSF, but less than 1.5 TSF.

- A. Cohesive soil
- B. Granular soils
- C. Submerged soil
- D. Submerged rock
- E. None of the Above

39. Granular cohesion-less soil including _____, silt, silt loam, and sandy loam.

- A. Cohesive soil
- B. Granular soils
- C. Submerged soil
- D. Submerged rock
- E. None of the Above

40. The soil has been previously disturbed, except soil classified as _____ soil.

- A. Stable rock
- B. Type A
- C. Type B
- D. Type C
- E. None of the Above

41. Soil that meets the unconfined compressive strength requirements of _____ soil, but is fissured or subject to vibration. Dry rock that is unstable.

- A. Stable rock
- B. Type A
- C. Type B
- D. Type C
- E. None of the Above

Type C soil is defined as:

42. _____ with an unconfined compressive strength of .5 TSF or less.

- A. Cohesive soil
- B. Granular soils
- C. Submerged soil
- D. Submerged rock
- E. None of the Above

43. _____ including gravel, sand and loamy sand.

- A. Cohesive soil
- B. Granular soils
- C. Submerged soil
- D. Submerged rock
- E. None of the Above

44. _____ or soil from which water is freely seeping.

- A. Cohesive soil
- B. Granular soils
- C. Submerged soil
- D. Submerged rock
- E. None of the Above

45. _____ that is not stable.

- A. Cohesive soil
- B. Granular soils
- C. Submerged soil
- D. Submerged rock
- E. None of the Above

Safe Drinking Water Act Terms

46. Community Water System (CWS). A public water system that serves at least 15 service connections used by year-round residents of the area served by the _____ serves at least 25 year-round residents.

- A. Transient and non-transient people
- B. State
- C. Operators
- D. System
- E. None of the Above

47. _____. In the SDWA, an MCL is defined as "the maximum permissible level of a contaminant in water which is delivered to any user of a public water system." MCLs are enforceable standards.

- A. Maximum Contaminant Level Goal (MCLG)
- B. Nephelometric Turbidity Units (NTU)
- C. Maximum Contaminant Level (MCL)
- D. Methemoglobinemia
- E. None of the Above

48. _____. The maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health effect of persons would occur, and which allows for an adequate margin of safety.

- A. Maximum Contaminant Level Goal (MCLG)
- B. Nephelometric Turbidity Units (NTU)
- C. Maximum Contaminant Level (MCL)
- D. Public health goals
- E. None of the Above

49. _____ are non-enforceable public health goals.

- A. Maximum Contaminant Level Goal (MCLG)
- B. Nephelometric Turbidity Units (NTU)
- C. Maximum Contaminant Level (MCL)
- D. Public health goals
- E. None of the Above

50. _____ A unit of measure used to describe the turbidity of water. Turbidity is the cloudiness in water.
- A. Maximum Contaminant Level Goal (MCLG)
 - B. Nephelometric Turbidity Units (NTU)
 - C. Maximum Contaminant Level (MCL)
 - D. Public health goals
 - E. None of the Above
51. Cryptosporidium. A _____ associated with the disease cryptosporidiosis in humans. The disease can be transmitted through ingestion of drinking water, person-to-person contact, or other exposure routes.
- A. Bacteria
 - B. Salmonella
 - C. Hazardous fluids
 - D. Protozoan
 - E. None of the Above
52. Cryptosporidiosis may cause acute diarrhea, abdominal pain, vomiting, and fever that last 1-2 weeks in healthy adults, but may be chronic or fatal in _____ people.
- A. Over-healthy
 - B. Healthy
 - C. Immuno-compromised
 - D. Sickly
 - E. None of the Above
53. Giardia lamblia. A protozoan, which can survive in water for 1 to 3 months, associated with the disease _____.
- A. Hepatitis
 - B. Salmonella
 - C. Giardiasis
 - D. Gastrointestinal
 - E. None of the Above
54. Ingestion of this protozoan in contaminated drinking water, exposure from person-to-person contact, and other exposure routes may cause _____.
- A. Hepatitis
 - B. Salmonella
 - C. Giardiasis
 - D. Gastrointestinal disease
 - E. None of the Above
55. The symptoms of this _____ may persist for weeks or months and include diarrhea, fatigue, and cramps.
- A. Bacteria
 - B. Salmonella
 - C. Virus
 - D. Gastrointestinal bug
 - E. None of the Above

New EPA Water Rules

56. _____ is a chemical that occurs naturally in the earth's crust. When rocks, minerals, and soil erode, they release arsenic into water supplies.

- A. Trihalomethanes
- B. Arsenic
- C. Microbial contaminants
- D. Haloacetic Acids
- E. None of the Above

57. When people either drink this water or eat animals and plants that drink it, they are exposed to arsenic. In the U.S., eating and drinking are the most common ways that people are exposed to _____, although it can also come from industrial sources.

- A. Trihalomethanes
- B. Arsenic
- C. Microbial contaminants
- D. Haloacetic Acids
- E. None of the Above

58. Studies have linked long-term exposure of _____ in drinking water to a variety of cancers in humans.

- A. Trihalomethanes
- B. Arsenic
- C. Microbial contaminants
- D. Haloacetic Acids
- E. None of the Above

Disinfection (Chlorination, Ozonation)

59. Water is then disinfected to ensure that dangerous _____. Chlorine-based disinfectants or ozone are used because they are very effective.

- A. Residual protection
- B. Bugs are withdrawn from wells
- C. Contaminates in the groundwater
- D. Microbes are killed
- E. None of the Above

60. Chlorine-based disinfectants also _____ against biological contamination in the water distribution system. This is a critical step to assure our water is safe all the way to the consumer's tap.

- A. Provide residual protection
- B. Are withdrawn from wells
- C. Contaminate the groundwater
- D. Add favor
- E. None of the Above

Groundwater and Wells

61. A well can be easily contaminated if it is not properly constructed or if toxic materials are released into the well. Toxic material spilled or dumped near a well can leach into the aquifer and _____ drawn from that well.

- A. Provide residual protection
- B. Withdrawn from wells
- C. Contaminate the groundwater
- D. Kill microbes
- E. None of the Above

Contaminated Wells

62. Contaminated wells used for drinking water are _____. Wells can be tested to see what chemicals may be in the well and if they are present in dangerous quantities.

- A. Can provide residual protection
- B. Approved
- C. Contaminating the groundwater
- D. Especially dangerous
- E. None of the Above

63. Groundwater is _____ to provide water for everything from drinking water for the home and business to water to irrigate crops to industrial processing water.

- A. Providing residual protection
- B. Withdrawn from wells
- C. Contaminated
- D. Filled with microbes
- E. None of the Above

64. When water is pumped from the ground, the _____ flow change in response to this withdrawal.

- A. Drawdown
- B. Withdrawn
- C. Dynamics of groundwater
- D. Pressure
- E. None of the Above

65. Groundwater flows slowly through water-bearing formations (_____) at different rates. In some places, where groundwater has dissolved limestone to form caverns and large openings, its rate of flow can be relatively fast but this is exceptional.

- A. Saturated zone
- B. Water table
- C. Aquifers
- D. Karst
- E. None of the Above

Aquifer

66. A well in such an aquifer is called a(n) _____.

- A. Artesian well
- B. Water table
- C. Aquifers
- D. Groundwater
- E. None of the Above

67. The water in these wells rises higher than the top of the aquifer because of confining pressure. If the water level rises above the ground surface a flowing _____ occurs.

- A. Artesian well
- B. Water table
- C. Aquifers
- D. Groundwater
- E. None of the Above

68. The piezometric surface is the level to which the water in a(n) _____ aquifer will rise.
- Artesian
 - Water table
 - Aquifers
 - Groundwater
 - None of the Above
69. When pumping begins, water begins to flow towards the well in contrast to the natural direction of _____ movement.
- Artesian well
 - Water table
 - Aquifers
 - Groundwater
 - None of the Above
70. Many terms are used to describe the nature and extent of the groundwater resource. The level below which all the spaces are filled with water is called the _____.
- Saturated zone
 - Water table
 - Aquifers
 - Karst
 - None of the Above
71. Above the _____ lies the unsaturated zone. Here the spaces in the rock and soil contain both air and water.
- Saturated zone
 - Water table
 - Aquifers
 - Karst
 - None of the Above
72. The water level in the well falls below the _____ in the surrounding aquifer.
- Artesian well
 - Water table
 - Aquifers
 - Groundwater
 - None of the Above
73. As a result, water begins to move from the _____ into the well. As pumping continues, the water level in the well continues to increase until the rate of flow into the well equals the rate of withdrawal from pumping.
- Artesian well
 - Water table
 - Aquifer
 - Groundwater
 - None of the Above
74. The movement of water from a(n) _____ into a well results in the formation of a cone of depression.
- Cone of depression
 - Water table
 - Aquifer
 - Groundwater
 - None of the Above

75. Water in this zone is called soil moisture. The entire region below the water table is called the _____ and water in this saturated zone is called groundwater.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
76. Fractured _____ are cracks, joints, or fractures in solid rock, through which groundwater moves. Examples of fractured aquifers include granite and basalt.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
77. Limestones are often fractured _____, but here the cracks and fractures may be enlarged by solution, forming large channels or even caverns.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
78. Limestone terrain where solution has been very active is termed _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
79. Porous media such as sandstone may become so highly cemented or recrystallized that all of the original space is filled. In this case, the rock is no longer a _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
80. If it contains cracks it can still act as a fractured _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifer
 - D. Karst
 - E. None of the Above
81. Most of the _____ of importance to us are unconsolidated porous media such as sand and gravel.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above

82. Some very porous materials are not _____. Clay, for instance, has many spaces between its grains, but the spaces are not large enough to permit free movement of water.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
83. Groundwater usually flows downhill with the slope of the _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
84. Like surface water, _____ flows toward, and eventually drains into, streams, rivers, lakes and the oceans.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
85. _____ flow in the aquifers underlying springs or surface drainage basins, however, does not always mirror the flow of water on the surface.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
86. _____ may move in different directions below the ground than the water flowing on the surface.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
87. Unconfined aquifers are those that are bounded by the _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
88. Some aquifers, however, lie beneath layers of impermeable materials. These are called confined _____, or some-times artesian aquifers.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above

89. The _____ describes a three-dimensional inverted cone surrounding the well that represents the volume of water removed as a result of pumping.

- A. Cone of depression
- B. Water table
- C. Aquifers
- D. Groundwater
- E. None of the Above

90. _____ is the vertical drop in the height between the water level in the well prior to pumping and the water level in the well during pumping.

- A. Cone of depression
- B. Water level
- C. Aquifers
- D. Groundwater
- E. None of the Above

91. When a well is installed in an unconfined aquifer, water moves from the _____ into the well through small holes or slits in the well casing or, in some types of wells, through the open bottom of the well.

- A. Cone of depression
- B. Water level
- C. Aquifer
- D. Groundwater
- E. None of the Above

92. The level of the water in the well is the same as the water level in the _____. Groundwater continues to flow through and around the well in one direction in response to gravity.

- A. Cone of depression
- B. Water level
- C. Aquifer
- D. Groundwater
- E. None of the Above

Water Use or Demand

93. Water system _____ comes from a number of sources including residential, commercial, industrial and public consumers as well as some unavoidable loss and waste.

- A. Per person usage
- B. Average daily use
- C. Quantity and pressure
- D. Demand
- E. None of the Above

94. If fire protection is desired, that could also represent a rather significant (although not continuous) _____.

- A. Per person usage
- B. Average daily use
- C. Quantity and pressure
- D. Demand upon the system
- E. None of the Above

95. The combination of storage reservoirs and distribution lines must be capable of meeting consumers' needs for quality, _____ at all times.
- Per person usage
 - Average daily use
 - Quantity and pressure
 - Demand upon the system
 - None of the Above
96. The _____ of water used in any community varies from 50 to 500 gallons per person per day.
- Per person usage
 - Average daily use
 - Quantity
 - Demand upon the system
 - None of the Above
97. A common design assumption is to use from 100 to 150 gallons _____ per day for average domestic use.
- Per person
 - Average daily use
 - Of water
 - Demand
 - None of the Above
98. The _____ is approximately 2 to 3 times the average daily use.
- Water pressure
 - Minimum required
 - Maximum daily use
 - Demand
 - None of the Above
99. _____ is usually encountered during the summer months and can vary widely depending on irrigation practices.
- Water pressure
 - Minimum required
 - Maximum daily use
 - Demand
 - None of the Above

Water Pressure

100. For ordinary domestic use, _____ should be between 25 and 45 psi.
- Water pressure
 - Minimum required
 - Maximum daily use
 - Demand
 - None of the Above
101. A minimum of 60 psi at a fire hydrant is usually adequate, since that allows for up to 20 psi _____ in fire hoses.
- Water pressure
 - Minimum required
 - Maximum daily use
 - Pressure drop
 - None of the Above

102. In commercial and industrial districts, it may be common to have 75 psi or higher. 20 psi is considered the _____ at any point in the water system, so that backflow and infiltration is prevented.

- A. Water pressure
- B. Minimum required
- C. Maximum daily use
- D. Demand
- E. None of the Above

103. Pressure is provided by the _____ of the water (such as water from a pump), or by the height of the water (such as a storage reservoir). 2.31 feet of water is equal to 1 psi, or 1 foot of water is equal to about a half a pound (.433 pounds to be exact).

- A. Water pressure
- B. Minimum required
- C. Maximum daily use
- D. Direct force
- E. None of the Above

Water Use or Demand

104. Water system demand comes from a(n) _____ including residential, commercial, industrial and public consumers as well as some unavoidable loss and waste.

- A. Quality, quantity and pressure
- B. Unavoidable loss and waste
- C. Common design assumption
- D. Number of sources
- E. None of the Above

105. If fire protection is desired, that could also represent a rather significant (although not continuous) _____.

- A. Quality, quantity and pressure
- B. Unavoidable loss and waste
- C. Common design assumption
- D. Rather significant
- E. None of the Above

106. The combination of storage reservoirs and distribution lines must be capable of meeting consumers' needs for _____ at all times.

- A. Quality, quantity and pressure
- B. Unavoidable loss and waste
- C. Common design assumption
- D. Rather significant demand
- E. None of the Above

107. The quantity of water used in any community varies from 50 to 500 gallons per person per day. A _____ is to use from 100 to 150 gallons per person per day for average domestic use.

- A. Quality, quantity and pressure
- B. Unavoidable loss and waste
- C. Common design assumption
- D. Rather significant demand
- E. None of the Above

108. The _____ is approximately 2 to 3 times the average daily use. Maximum daily use is usually encountered during the summer months and can vary widely depending on irrigation practices.

- A. Quality, quantity and/or pressure
- B. Unavoidable loss and waste
- C. Maximum daily use
- D. GPD
- E. None of the Above

Water Pressure

109. For ordinary _____, water pressure should be between 25 and 45 psi.

- A. Domestic use
- B. Commercial and industrial districts
- C. Water supplying
- D. On-going maintenance costs
- E. None of the Above

110. A minimum of 60 psi at a fire hydrant is _____, since that allows for up to 20 psi pressure drop in fire hoses.

- A. The minimum required
- B. Normal in commercial and industrial districts
- C. Approved for supplying water
- D. Usually adequate
- E. None of the Above

111. In _____, it may be common to have 75 psi or higher.

- A. Minimum required zones
- B. Commercial and industrial districts
- C. Supplying water
- D. Hills and mountains
- E. None of the Above

112. 20 psi is considered the minimum required at any point in the water system, so that backflow and _____.

- A. Infiltration is prevented
- B. Cross-Connections
- C. Pumping is limited
- D. Water hammer
- E. None of the Above

113. Pressure is provided by the _____ of the water (such as water from a pump), or by the height of the water (such as a storage reservoir). 2.31 feet of water is equal to 1 psi, or 1 foot of water is equal to about a half a pound (.433 pounds to be exact).

- A. Pumping
- B. Surging
- C. Storing
- D. Direct force
- E. None of the Above

Storage and Distribution

114. The _____ water to the users of any water system includes the installation of storage and distribution facilities.

- A. Minimum required
- B. Commercial and industrial districts
- C. Cost of supplying
- D. On-going maintenance costs
- E. None of the Above

115. There are _____ associated with cleaning, repairing and replacing these facilities.

- A. Many factors
- B. Commercial and industrial districts concerns
- C. Supplying water issues
- D. On-going maintenance costs
- E. None of the Above

116. The distribution system must also _____ between the source and the customer's tap.

- A. Protect water quality
- B. Be aware of this phenomenon
- C. Provide pressure potential energy
- D. Maintain system integrity
- E. None of the Above

117. Proper construction is important in maintaining system integrity. Care must be taken that no foreign material is _____ during pipe laying operations.

- A. In the water distribution system
- B. Aware of this phenomenon
- C. Introduced into the system
- D. Maintaining integrity
- E. None of the Above

118. Pipe ends should be covered at the end of the work day or during _____.

- A. Interruptions of construction
- B. Work
- C. Potential delays
- D. Maintaining system integrity
- E. None of the Above

119. All _____ should be pressure tested and disinfected with a 5% chlorine solution such as household bleach before backfilling.

- A. Fire hydrants
- B. Phenomenon's
- C. Pressure zones
- D. Well sites
- E. None of the Above

Water Storage Facilities

120. Water storage facilities and tanks vary in _____. There are different types that are used in the water distribution systems, such as stand pipes, elevated tanks and reservoirs, hydropneumatic tanks and surge tanks.

- A. The water distribution system
- B. Size, shape, and application
- C. Pressure potential energy
- D. None of the Above

Surge Tanks

121. The goal of the water tower or stand pipe is to _____ in the air, where it has lots of gravitational potential energy.

- A. Stored energy
- B. Store water high
- C. Park under it or hide during the day
- D. Storage be equal
- E. None of the Above

122. This _____ can be converted to pressure potential energy or kinetic energy for delivery to homes.

- A. Stored energy
- B. Facility
- C. Water storage
- D. Power
- E. None of the Above

123. Since height is everything, building a cylindrical water tower is inefficient. Most of the water is then near the ground. By making the tower wider near the top, it puts most of its _____.

- A. Stored energy
- B. Water up high
- C. Water storage
- D. Storage
- E. None of the Above

124. What really causes _____ - ENERGY - when released in a confined space, such as a water distribution system.

- A. Break dances
- B. Water hammer
- C. Pressure potential energy
- D. Water main breaks
- E. None of the Above

125. Shock waves are created when hydrants, valves, or pumps are opened and closed quickly, _____ of moving water within the confined space of a piping system.

- A. Water distribution
- B. Trapping the kinetic energy
- C. Pressure potential energy
- D. Maintaining flow
- E. None of the Above

126. _____ can create a turbulence that travels at the speed of sound, seeking a point of release.

- A. Water distribution systems
- B. These shock waves
- C. Pressure potential energy
- D. Maintaining water hammers
- E. None of the Above

127. The _____ usually finds is an elevated tank, but the surge doesn't always find this release quickly enough. Something has to give, and oftentimes, it's your pipe fittings. Distribution operators are aware of this phenomenon! It's called WATER HAMMER.
- A. Water distribution system
 - B. Release the surge
 - C. Pressure potential energy
 - D. System integrity
 - E. None of the Above

128. A Surge tank should not be used for _____.
- A. Stored energy
 - B. Storing water high
 - C. Water storage
 - D. Storage be equal
 - E. None of the Above

Storage Reservoirs

129. Storage reservoirs allow the system to meet the fluctuations in demand described earlier. It is recommended that the volume of storage be equal to from one to three days of the system's ____.
- A. Stored energy
 - B. Store water high
 - C. Average daily use
 - D. Storage be equal
 - E. None of the Above

130. It is also recommended that storage reservoirs be located at a high enough elevation to allow the water to _____ to the distribution system.
- A. Store energy
 - B. Store water high
 - C. Flow by gravity
 - D. Storage be equal
 - E. None of the Above

131. This, coupled with restricted usage on the part of the consumers, should provide an uninterrupted water supply in the event of pump failure, loss of power or an acute contamination event or _____. Also, if applicable, some storage for fire protection should be provided.
- A. Pump failure
 - B. Cross-connection
 - C. Power failure
 - D. Construction
 - E. None of the Above

132. Reservoirs are also used as detention basins to provide the required chlorine contact time necessary to ensure the _____.
- A. Water tastes good
 - B. Adequacy of disinfection
 - C. Maximum potential
 - D. Pressure
 - E. None of the Above

133. As such, the contact time in a reservoir is _____ when the reservoir is constructed with a separate inlet and outlet pipe, preferably located on opposite sides of the reservoir and at different levels.

- A. Greatly improved
- B. On opposite sides
- C. Apparently degraded
- D. Acceptable
- E. None of the Above

134. Baffles inside the reservoir (walls, curtains, or spirals) increase the contact time by preventing the water from leaving the reservoir too quickly (known as “_____”).

- A. Partial contact
- B. Jamming
- C. Jumping
- D. Short-circuiting
- E. None of the Above

Steel Reservoirs

135. Steel reservoirs or tanks generally have lower construction and installation costs than concrete, but _____.

- A. Require more maintenance
- B. Are heavy
- C. Apparently larger
- D. Lower construction costs
- E. None of the Above

136. To protect against corrosion, the exterior should be kept cleaned and painted. Interiors of steel reservoirs are _____ with an epoxy or enamel-type finish.

- A. Filled
- B. Commonly coated
- C. Apparently sprayed
- D. Hand painted
- E. None of the Above

137. Some coal-tar linings used in the past have apparently degraded over time and are implicated in the release of small _____ into the stored water.

- A. Pieces of coal
- B. Amounts of solvents
- C. Objects
- D. Tastes
- E. None of the Above

138. Steel reservoirs are usually welded or bolted together and are manufactured in a variety of sizes. Small steel reservoirs can be _____ and then trucked and lifted into place.

- A. Heavy
- B. Carried
- C. Lifted
- D. Manufactured off-site
- E. None of the Above

139. Steel tanks should be inspected once a year and _____ every 5-7 years.

- A. Repainted
- B. Moved
- C. Changed
- D. Expanded
- E. None of the Above

140. Steel tank should also have cathodic protection and be screened to keep birds and insects out. The maintenance program for reservoir tanks should call for _____ for a complete inspection of the interior.

- A. Scuba divers
- B. Annual draining
- C. Bird inspection
- D. Certified operator
- E. None of the Above

141. Cleaning and disinfection _____ the reservoir or tank back in service is necessary.

- A. Is not my job at
- B. Is rarely completed
- C. Prior to placing
- D. Has no effect
- E. None of the Above

Disinfection by chlorine can be accomplished by one of three methods:

142. Fill the tank or reservoir with a 25 mg/1 _____ and leave it for 24 hours.

- A. Chlorine solution
- B. Chlorinated water
- C. HOCL
- D. HCL
- E. None of the Above

143. Fill the reservoir with a 50 mg/1 _____ and leave it for 3 hours.

- A. Chlorine solution
- B. Chlorinated water
- C. HOCL
- D. HCL
- E. None of the Above

144. Spray or brush on a 200 mg/1 _____ and allow it to remain for 3 hours.

- A. Chlorine solution
- B. Chlorinated water
- C. HOCL
- D. HCL
- E. None of the Above

145. The _____ shall be disposed of in a manner that will not have an adverse effect on the environment. Check with your state environmental, health or drinking water section.

- A. Chlorine solution
- B. Chlorinated water
- C. HOCL
- D. HCL
- E. None of the Above

146. The distribution system is the piping that delivers water to service connections. There are several types of piping material that can be used. Each has its _____.

- A. Problems
- B. Service maintenance
- C. Advantages and disadvantages
- D. Corrosion resistant exteriors
- E. None of the Above

147. The pipe material must have adequate strength to withstand external loads from backfill, traffic and earth movement, high burst strength to withstand high water pressure, smooth interior surfaces, _____ and tight joints.

- A. Mechanical glands
- B. Service maintenance
- C. Advantages and disadvantages
- D. Corrosion resistant exteriors
- E. None of the Above

Hydropneumatic Tank Section

Effects on the Water Supply

148. Whenever a tank must be taken out of _____, the operator should insure that the water pressure is maintained by other back-up tanks in the system.

- A. The trench
- B. Service for maintenance
- C. The pressure zone
- D. Operation
- E. None of the Above

149. If this is not possible, _____ should be given as much advance notice as possible, maintenance should be conducted during periods of low water demand, and the maintenance should be conducted as quickly as possible to reduce the time without water service.

- A. Operator(s)
- B. Superintendents
- C. Individuals
- D. Customers
- E. None of the Above

Troubleshooting Hydropneumatic Tank Problems

150. The purpose of a(n) _____ is to provide air for the water system. It is the responsibility of the operator to perform basic troubleshooting of problems in hydropneumatic tank systems.

- A. Operator(s)
- B. Hydropneumatic tank
- C. Surge tank
- D. Supply tank
- E. None of the Above

151. The _____ has to decide, based on his/her own training and capability when a problem requires assistance from another operator or an outside expert.

- A. Operator(s)
- B. Superintendent(s)
- C. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

152. _____ should not hesitate to seek assistance if they are uncomfortable with a particular problem or situation.

- A. Operator(s)
- B. Superintendent(s)
- C. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

153. The goal is to provide a safe and consistent supply of water and this cannot always be accomplished by one or two _____ who may have many other responsibilities. Corrective action should only be performed by individuals who are trained and skilled in that particular area.

- A. Operator(s)
- B. Superintendent(s)
- C. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

Distribution Valves

154. The purpose of installing _____ in water mains at various locations within the distribution system is to allow sections of the system to be taken out of service for repairs or maintenance, without significantly curtailing service over large areas.

- A. Shutoff valves
- B. A frames
- C. Fire Hydrants
- D. Vaults or manholes
- E. None of the Above

155. _____ should be installed at intervals not greater than 5,000 feet in long supply lines, and 1,500 feet in main distribution loops or feeders.

- A. Valves
- B. A frames
- C. Fire Hydrants
- D. Vaults or manholes
- E. None of the Above

156. All branch mains connecting to feeder mains or feeder loops should have valves installed as close to the feeders as practical. In this way, _____ can be taken out of service without interrupting the supply to other locations.

- A. Valves
- B. A frames
- C. Fire Hydrants
- D. Branch mains
- E. None of the Above

157. In the areas of greatest water demand, or when the dependability of the distribution system is particularly important, _____ of 500 feet may be appropriate.

- A. Valves
- B. A frames
- C. Valve spacing
- D. Vaults or manholes
- E. None of the Above

158. At intersections of distribution mains, the number of _____ required is normally one less than the number of radiating mains.

- A. Fire Hydrants
- B. Mains
- C. Valves
- D. Vaults or manholes
- E. None of the Above

159. The _____ omitted from the line is usually the one that principally supplies flow to the intersection.

- A. Stoneline
- B. POE
- C. Valve
- D. Tie
- E. None of the Above

160. Shutoff _____ should be installed in standardized locations (that is, the northeast corner of intersections or a certain distance from the center line of streets), so they can be easily found in emergencies.

- A. Installing shutoff valves
- B. Interrupting the supply
- C. Valve(s)
- D. Vault or manhole
- E. None of the Above

161. All buried small and medium-sized valves should be installed in valve boxes. For large shutoff valves (about 30 inches in diameter and larger), it may be necessary to surround the valve operator or entire _____ within a vault or manhole to allow repair or replacement.

- A. Cu-de-sac
- B. Resetter
- C. Valve
- D. Bypass
- E. None of the Above

Classification of Valves

162. There are two major classifications of water _____: Rotary and Linear. Linear is a fancy word for up and down or blade movement.

- A. Hydrants
- B. Hammers
- C. Valve(s)
- D. Vaults or manholes
- E. None of the Above

Gate Valve Linear Valve Our primary Linear valve

163. The most common valve in the distribution system. Primarily used for _____. Should be exercised on annual basis.

- A. Installing
- B. Interrupting the supply
- C. Main line shut downs
- D. Exercising
- E. None of the Above

164. _____ are used when a straight-line flow of fluid and minimum flow restriction are needed.
- A. Wedge-shaped
 - B. Pressure drop
 - C. Gate valve
 - D. Rotary
 - E. None of the Above
165. _____ are so-named because the part that either stops or allows flow through the valve acts somewhat like a gate.
- A. Wedge-shaped
 - B. Pressure drop
 - C. Gate valve
 - D. Rotary
 - E. None of the Above
166. The gate is usually _____. When the valve is wide open the gate is fully drawn up into the valve bonnet.
- A. Wedge-shaped
 - B. Pressure sensitive
 - C. Flat
 - D. Rounded
 - E. None of the Above
167. This leaves an opening for flow through the valve the _____ as the pipe in which the valve is installed.
- A. Same size
 - B. Pressure drop
 - C. Pressure
 - D. Bonnet
 - E. None of the Above
168. Therefore, there is little _____ or flow restriction through the valve. Gate valves are not suitable for throttling purposes.
- A. Error
 - B. Pressure drop
 - C. Problem
 - D. Velocity
 - E. None of the Above
169. The _____ is difficult because of the valve's design, and the flow of fluid slapping against a partially open gate can cause extensive damage to the valve.
- A. Bonnet
 - B. Specifically sized stem
 - C. Creating a water hammer
 - D. Control of flow
 - E. None of the Above
170. Except as specifically authorized, gate valves _____.
- A. Should not shut the water off
 - B. Should not be used for throttling
 - C. Can create a water hammer
 - D. Are jammed-tight
 - E. None of the Above

171. Dr. Rusty Randall likes to listen to the Valve Key when shutting down a Gate valve. You will easily hear it sing as you _____ or leak by.

- A. Shut the water off
- B. Turn the key on after five turns
- C. Create a water hammer
- D. Jam it
- E. None of the Above

172. It is very easy to _____ with opening or closing a Gate valve. Always take your time when operating a gate valve or any valve.

- A. Shut the water off
- B. Get fired
- C. Create a water hammer
- D. Jam-tight
- E. None of the Above

Problems

Valve Jammed Open

173. Dr. Rusty recommends that opened valves should not be _____ on the backseat.

- A. Left
- B. Hammered
- C. Over pressurized
- D. Jammed-tight
- E. None of the Above

174. Always back the valve-off a _____ from the fully opened position.

- A. Three turns
- B. Torque
- C. Little
- D. Quarter turn
- E. None of the Above

175. Note that motor operated valves coast inevitably to the backseat by tripping on a limit switch. Valve should not be _____ on torque.

- A. Back seated
- B. Applied
- C. Worked
- D. Valve sealed
- E. None of the Above

Valve Jammed Closed

176. Variations in the temperature and/or pressure of the working fluid are often the cause of a valve _____.

- A. Back seated
- B. Torqued
- C. Failing to open
- D. Valve sealing
- E. None of the Above

177. _____ can occur in high temperature situations depending on the seat and wedge material, length of exposure and closing torque applied.

- A. Back seating
- B. Torque applying
- C. Thermal binding
- D. Valve sealing
- E. None of the Above

178. Thermal binding can cause galling on the _____ surfaces as well as on the guides.

- A. Port
- B. Stem
- C. Bonnet
- D. Valve sealing
- E. None of the Above

179. A valve can lock in the closed position when high pressure enters the cavity and has no way to escape. This is known as _____.

- A. Back seating
- B. Hammer toe
- C. Over-pressurization
- D. Valve sealing
- E. None of the Above

If Excessive Torque is Needed to Work the Valve

180. Variations in the temperature and/or pressure of the working fluid are often the cause of a valve _____.

- A. Seated
- B. Failing to open
- C. Exploding
- D. Sealing
- E. None of the Above

181. _____ can occur in high temperature situations depending on the seat and wedge material, length of exposure and closing torque applied.

- A. Back seating
- B. Implosion
- C. Thermal binding
- D. Valve sealing
- E. None of the Above

182. _____ can cause galling on the valve sealing surfaces as well as on the guides.

- A. Back seating
- B. Imploding
- C. Thermal binding
- D. Valve sealing
- E. None of the Above

183. A valve can lock in the closed position when high pressure enters the cavity and has no way to escape. This is known as _____.

- A. Back seating
- B. Imploding
- C. Thermal binding
- D. Over-pressurization
- E. None of the Above

184. Single direction sealing gate valves have a nameplate on the side of the valve that has a relief hole or _____. This should be the high pressure side when the valve is closed.

- A. Back seat
- B. Torque applied
- C. Thermal binding
- D. Pressure equalizer
- E. None of the Above

Globe Valve Rotary Valve

185. It is primarily used for _____, and works similar to a faucet. Rare to find in most distribution systems, but can be found at treatment plants.

- A. Flow regulation
- B. Standard procedures
- C. Renewing seat ring
- D. Economical flow control
- E. None of the Above

186. Always follow _____ when working on a valve.

- A. Flow regulation direction
- B. Standard safety procedures
- C. Lead Operator
- D. Flow control
- E. None of the Above

187. Most Globes have compact OS & Y type, bolted bonnet, rising stem, with _____ valves.

- A. Flow regulation
- B. Big
- C. Cla-Val
- D. Economical flow control
- E. None of the Above

188. A Check Valve spring loaded disc resulting with most advanced design features provides the ultimate in dependable, _____.

- A. Flow regulation
- B. Usage
- C. Stem wear
- D. Economical flow control
- E. None of the Above

189. Globe valves should usually be installed with the inlet below the valve _____.

- A. Stem
- B. Inlet
- C. Packing
- D. Seat
- E. None of the Above

190. For severe _____, the valve may be installed so that the flow enters over the top of the seat and goes down through it. Note that in this arrangement, the packings will be constantly pressurized.

- A. Stem use
- B. Throttling service
- C. Packing
- D. Wear
- E. None of the Above

191. If the valve is to be installed near throttling service, verify with an outside contractor or a skilled valve technician. Globe valves, per se, are not suitable for _____.

- A. Stem
- B. Inlet or wearing
- C. Packings
- D. Throttling service
- E. None of the Above

192. The valve should be welded onto the line with the disc in the fully closed position. Leaving it even partially open can cause distortion and leaking. Allow time for the weld to cool before operating the _____ the first time in the pipeline. The preferred orientation of a globe valve is upright.

- A. Bonnet
- B. Valve
- C. Packings
- D. Inlet or wearing
- E. None of the Above

193. The valve may be installed in other orientations, but any deviation from vertical is a compromise. Installation upside down is not recommended because it can cause dirt to accumulate in the _____.

- A. Stem
- B. Mechanism
- C. Packings
- D. Bonnet
- E. None of the Above

Globe Valve Problems and Solutions

194. If the valve _____ is improperly lubricated or damaged: disassemble the valve and inspect the stem.

- A. Stem
- B. Valves
- C. Packings
- D. Mechanism
- E. None of the Above

195. Acceptable deviation from theoretical centerline created by joining center points of the ends of the stem is 0.005"/ft of _____. Inspect the threads for any visible signs of damage.

- A. Stem
- B. Valves
- C. Packings
- D. Mechanism
- E. None of the Above

196. Small _____ less than 0.005" can be polished with an Emory cloth.

- A. Stem
- B. Valves
- C. Packings
- D. Upright
- E. None of the Above

197. Contact specialized services or an outside contractor if run-out is unacceptable or large grooves are discovered on the surface of the _____.

- A. Stem
- B. Valves
- C. Packings
- D. Upright
- E. None of the Above

198. If the valve _____ compression is too tight: Verify the packing bolt torque and adjust if necessary.

- A. Stem
- B. Valves
- C. Packing
- D. Skirts
- E. None of the Above

199. Foreign debris is trapped on threads and/or in the packing area: This is a common problem when _____ are installed outdoors in sandy areas and areas not cleaned before operating.

- A. Stem
- B. Valves
- C. Packings
- D. Mechanisms
- E. None of the Above

200. Always inspect threads and _____ area for particle obstructions, even seemingly small amounts of sand trapped on the drive can completely stop large valves from cycling.

- A. Stem
- B. Valves
- C. Packing
- D. Needles
- E. None of the Above

201. The valve may stop abruptly when a cycle is attempted. With the line pressure removed from the valve, disconnect the actuator, gear operator, or handwheel and inspect the drive nut, _____, bearings and yoke bushing.

- A. Stem
- B. Valves
- C. Packings
- D. Mechanism
- E. None of the Above

202. _____ should be cleaned with a lint-free cloth using alcohol, varsol or equivalent. All parts should be re-lubricated before re-assemble.

- A. Backflow assemblies
- B. Contaminated parts
- C. Valve components
- D. Handwheel
- E. None of the Above

203. If the valves are installed outdoors in a sandy area, it may be desirable to cover the _____ with jackets.

- A. Backflow assemblies
- B. Swing check
- C. Valves
- D. Mechanism
- E. None of the Above

204. If the _____ are faulty or damaged: If you suspect that the valve components are damaged or faulty contact specialized services or an outside contractor.

- A. Backflow assemblies
- B. Swing check
- C. Valve components
- D. Mechanism
- E. None of the Above

205. If the valve's _____ is too small: Increasing the size of the handwheel will reduce the amount of torque required to operate the valve.

- A. Mechanism
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

206. If a larger _____ is installed, the person operating the valve must be careful not to over-torque the valve when closing it.

- A. Mechanism
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

Ball or Corporation Stop

207. Most commonly found on customer or water meters. All small _____ will have two Ball valves. It is the valve that is either fully on or fully off.

- A. Backflow assemblies
- B. Swing checks
- C. Valve components
- D. Vacuum breakers
- E. None of the Above

208. Most ball valves are the quick-acting type. They require only a 90-degree turn to either completely open or close the valve. However, many are operated by _____.

- A. Planetary gears
- B. Swing check
- C. Mechanisms
- D. Handwheel
- E. None of the Above

209. This type of gearing allows the use of a relatively small _____ and operating force to operate a fairly large valve. Always follow standard safety procedures when working on a valve.

- A. Operating time
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

210. The gearing does, increase the _____ for the valve.

- A. Operating time
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

211. Some ball valves also contain a swing check located within the ball to give the valve a _____ valve feature.

- A. Backflow assemblies
- B. Check
- C. Valve components
- D. Handwheel
- E. None of the Above

212. The _____ is often used for house appliance and industry appliance, the size range is 1/4"-4".

- A. Backflow assemblies
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

213. Brass or zinc is common for body, brass or iron for stem, brass or iron for ball, aluminum, stainless steel, or iron for handle including a _____ in the ball housing.

- A. Backflow assemblies
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

214. Flush the pipeline before installing the valve. Debris allowed to remain in the pipeline (such as _____, welding rods, bricks, tools, etc.) can damage the valve. After installation, cycle the valve a minimum of three times and re-torque bolts as required.

- A. Backflow assemblies
- B. Swing check
- C. Valve components
- D. Weld spatters
- E. None of the Above

215. Ensure that the valve is in the open position and the inside of the body bore of the valve body/body end is coated with a suitable _____.

- A. Spatter guard
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

Butterfly Valve Rotary Valve

216. Usually a huge water valve found in both treatment plants and throughout the distribution system. If the valve is not broken, it is relatively easy to operate. It is usually accompanied by a Gate valve used as a by-pass to _____.

- A. Valve shaft horizontal or inclined from vertical
- B. Prevent water hammer
- C. Can damage the valve disc
- D. Open or close the valve
- E. None of the Above

217. These are rotary types of valves usually found on large transmission lines. They may also have an additional valve beside it, known as a "bypass" to _____.

- A. Move the shaft horizontal or inclined from vertical
- B. Prevent a water hammer
- C. Damage the valve disc
- D. Open or close the valve
- E. None of the Above

218. Some of these valves can require 300-600 turns to _____.

- A. Inclined from vertical
- B. Prevent water hammer
- C. Damage the valve disc
- D. Open or close
- E. None of the Above

219. Most "Valve Operators" will use a machine to open or close a Butterfly Valve, the machine will count the turns required to _____.

- A. Move valve shaft horizontal
- B. Prevent water hammer
- C. Can damage the valve disc
- D. Open or close the valve
- E. None of the Above

220. Butterfly valves should be installed with the _____.

Always follow standard safety procedures when working on a valve.

- A. Valve shaft horizontal or inclined from vertical
- B. Mechanism installed
- C. Bonnet removed
- D. Operator inside the valve (Large Valves only)
- E. None of the Above

221. The valve should be mounted in the preferred direction, with the "HP" marking. Thermal insulation of the _____ for operating temperatures above 392°F (200°C).

- A. Valve shaft
- B. Covering
- C. Valve disc
- D. Valve body is recommended
- E. None of the Above

222. The valve should be installed in the closed position to _____ in the disc is not damaged during installation.

- A. Ensure that the laminated seal
- B. Prevent water hammer
- C. Damage the valve disc
- D. Open or close the valve
- E. None of the Above

223. If the pipe is lined, make sure that the valve disc does not contact the pipe lining during the opening stroke. Contact with lining _____.

- A. Can turn the valve on
- B. Prevent water hammer
- C. Can damage the valve disc
- D. Will create time vortex
- E. None of the Above

Butterfly Valve Problems

A butterfly valve may have jerky operation for the following reasons:

224. If the packing is too tight. _____ torque until it is only hand tight.

- A. Loosen the packing
- B. Adaptor is misaligned and adjust
- C. Tighten to the required level and
- D. Shaft must be replaced and re-
- E. None of the Above

225. Tighten to the required level and then _____. Re-tighten, if required.

CAUTION: Always follow safety instructions when operating on valve.

- A. Loosen the packing
- B. Cycle the valve
- C. Tighten to the required level
- D. Replace shaft
- E. None of the Above

226. If the shaft seals are dirty or worn out: Clean or replace components, as per _____.

CAUTION: Always follow safety instructions when operating on valve.

- A. Packing instructions
- B. Adaptor regulations
- C. Assembly-disassembly procedure
- D. Operator guidelines
- E. None of the Above

227. If the shaft is bent or warped: The shaft must be replaced. _____ and contact an outside contractor or your expert fix- it person.

- A. Loosen the packing
- B. If the Adaptor is misaligned
- C. Tighten to the required level
- D. Remove valve from service
- E. None of the Above

228. If the actuator/shaft _____: Remove the actuator mounting and realign.

- A. Is missing
- B. Adaptor is misaligned
- C. Needs tightening to the required level
- D. Must be replaced
- E. None of the Above

229. If the valve has a pneumatic actuator, the _____: Increase the air supply pressure to standard operating level. Any combination of the following may prevent the valve shaft from rotating.

- A. Loosen the packing
- B. Adaptor is misaligned
- C. Tighten to the required level
- D. Air supply may be inadequate
- E. None of the Above

230. If the actuator is not working: Replace or _____ as required. Please contact specialized services or an outside contractor for assistance.

- A. Loosen the packing
- B. Repair the actuator
- C. Tighten to the required level
- D. Write it was bent
- E. None of the Above

231. If the valve is packed with debris: Cycle the valve and then flush to remove debris. A full cleaning may be required if flushing the valve does not _____. Flush or clean valve to remove the debris.

- A. Loosen
- B. Cycle
- C. Improve valve shaft rotation
- D. Work
- E. None of the Above

How do Pressure Relief Valves Operate?

232. Most pressure relief valves consist of a _____ system. The basic main Cla-Val valve is called a Hytrol Valve.

- A. Corp and a reseeter
- B. Main valve and pilot control
- C. Mechanism
- D. Spring and the weight
- E. None of the Above

233. When no pressure is in the valve, the _____ of the diaphragm assembly hold the valve closed.

- A. Malfunctioning valves and to prevent valves
- B. Spring and the weight
- C. Mechanism
- D. Controller and a separate data logger
- E. None of the Above

234. Often a small box _____ to an existing pilot PRV valve to control the main Pressure Reducing Valve on the pipe network.

- A. Will allow water from the distribution system
- B. Controller and a separate data logger
- C. Malfunctioning valves and to prevent valves
- D. Spring and the weight
- E. None of the Above

235. This single box contains both the control electronics and an integral data logger to save the _____ of having both a controller and a separate data logger.

- A. Malfunctioning valves and to prevent valves
- B. Cost and space
- C. Mechanism
- D. Work and expense
- E. None of the Above

236. There are basically two types of PRV controllers: time based (to reduce the pipe pressure at low demand times, e.g. at night) or flow modulated which can realize leakage savings throughout the _____ (by adjusting the pressure according to the demand, to prevent excessive pressure at any time of the day or night).

- A. Month
- B. Controller and a separate data logger
- C. Day and night
- D. Spring and the weight
- E. None of the Above

Valve Exercising

237. Valve exercising should be done once per year (especially main line valves) to detect _____ from becoming inoperable due to freezing or build-up of rust or corrosion.

- A. Angry customers
- B. Lost valve boxes
- C. Malfunctioning valves and to prevent valves
- D. Condition of the water main
- E. None of the Above

238. A valve inspection should include _____ to show distances (ties) to the valves from specific reference points (telephone poles, stonelines, etc.).

- A. Malfunctioning valves and to prevent valves
- B. Spring and the weight measurements
- C. Allowing water from the distribution system
- D. Controller and separate data logger information
- E. None of the Above

239. Hydrants are designed to _____ to be used for fire-fighting purposes.

- A. Allow water from the distribution system
- B. Provide the canines a suitable location
- C. Prevent water hammer
- D. Provide stoneline measurement
- E. None of the Above

More on Water Distribution Valves

240. Water distribution valves are provided in the design of the water systems to allow for the isolation and shut-off of water when _____.

- A. Corps need to be jumped
- B. Inspections are needed
- C. Emergency conditions occur
- D. Service connections are needed
- E. None of the Above

241. It is important to recognize that these valves are a critical link in the _____ that occur in the distribution system.

- A. Assessments of emergencies
- B. Inspections of emergencies
- C. Management of emergencies
- D. Mishaps and emergencies
- E. None of the Above

242. These valves are usually operated infrequently therefore, the establishment of an annual valve exercising program is essential to the viability of _____.

- A. Mishaps and emergencies
- B. Inspections
- C. An utility emergency operations plan
- D. Assessments of emergencies
- E. None of the Above

243. Emergency operations of water _____ presumes that the system operators are familiar with the exact locations of many key water valves within the water system.

- A. Action plan
- B. Inspections
- C. Emergency operations plan(s)
- D. Valve(s)
- E. None of the Above

244. The accuracy of all _____ and valve boxes are verified against existing records. If inconsistencies are found, the records are updated to reflect accurate information.

- A. Operator(s)
- B. Inspections
- C. Emergency operations plan(s)
- D. Valve(s)
- E. None of the Above

245. A(n) _____ is performed on each valve stem and nut to determine if any damage exists.

- A. Operation
- B. Inspection
- C. Assessment
- D. Report
- E. None of the Above

246. The _____ is fully closed and the number of turns necessary to accomplish a full closing is recorded.

- A. PRV
- B. Gate
- C. Bypass
- D. Valve(s)
- E. None of the Above

247. The _____ is re-opened, and the system flows are re-established.

- A. PRV
- B. Gate
- C. Bypass
- D. Valve(s)
- E. None of the Above

248. The _____ box and cover is cleaned, inspected for damaged and painted blue.

- A. Stoneline marker and
- B. A frame
- C. Bypass
- D. Valve(s)
- E. None of the Above

249. Exercising of all _____ should be accomplished at the same time as the valve inspection. The exercising program assures that the valve operates and loosens any encrustation from valve seats and gates.

- A. Meters
- B. Manifolds
- C. Emergency operations plan
- D. Valve(s)
- E. None of the Above

250. Many _____ manufacturers recommend that the valve stem be completely opened and then backed of by one complete turn.

- A. Valve box
- B. U.S.
- C. Hydrant
- D. Valve(s)
- E. None of the Above

Distribution System Hydrant Maintenance/Flushing

251. _____ provide not only fire protection, but also a method of moving large amounts of water out of various portions of the water system if microbiological and/or chemical contamination occurs and an emergency is declared.

- A. Fire hydrant(s)
- B. An emergency will
- C. Water department will
- D. Water storage
- E. None of the Above

252. _____ maintenance is conducted on all fire hydrants to assure their viability at all times.

- A. Fire hydrant(s)
- B. Emergency
- C. Water department
- D. Nozzle cap thread gaskets
- E. None of the Above

Fire hydrant maintenance includes the following specific procedures:

253. All _____ are inspected for leakage and repairs are made when necessary.
- A. Fire hydrant(s)
 - B. Kickers
 - C. Barrels
 - D. Nozzle cap thread gaskets
 - E. None of the Above
254. The _____ is fully opened and the ease of operation is noted.
- A. Fire hydrant(s)
 - B. Kickers
 - C. Barrels
 - D. Nozzle cap thread gaskets
 - E. None of the Above
255. The _____ is directed to waste. During this procedure, care is taken to direct and/or disperse the flow to minimize property damage.
- A. Hydrant flow
 - B. Emergency
 - C. Sewer
 - D. Nozzle cap thread gaskets
 - E. None of the Above
256. All fire hydrant _____ are inspected for thread damage and lubricated to provide ease of operation.
- A. Fire hydrant(s)
 - B. Kickers
 - C. Barrels
 - D. Nozzle cap
 - E. None of the Above
257. All fire hydrant _____ are inspected and replaced as necessary.
- A. Valves
 - B. Kickers
 - C. Barrels
 - D. Nozzle cap thread gaskets
 - E. None of the Above
258. If a(n) _____ is found to be inoperable, a tag is placed on the hydrant, and the "out of service" is immediately reported to the Fire Department.
- A. Fire hydrant(s)
 - B. Kickers
 - C. Barrels
 - D. Nozzle cap thread gaskets
 - E. None of the Above
259. Accurate records related to the maintenance procedures performed on the fire hydrants are maintained by the _____.
- A. Maintenance staff
 - B. Fire Department
 - C. Water department
 - D. Crew leaders
 - E. None of the Above

Water Meters

260. It is important to account for the water produced and supplied. A _____ should be installed on each source, with service meters placed at each point of use. These should be read and recorded periodically.

- A. Water utilities calculation
- B. Service meters
- C. Master meter
- D. Head loss calculation
- E. None of the Above

261. Totals from the _____ should be compared to totals from the service meters to compute the amount of water lost in the distribution system. This information is important in locating and eliminating leaks and unauthorized taps.

- A. Water utilities calculation
- B. Service meters
- C. Master meters
- D. Head loss calculation
- E. None of the Above

262. Losses of 10 to 20 percent are not uncommon in many distribution systems. Also, it has been shown that a system which is not metered is likely to have a water usage up to three times as great as a _____.

- A. Water utility
- B. Service meter
- C. Master meter
- D. Metered system
- E. None of the Above

263. _____ tend to water freely and have little incentive to repair plumbing leaks.

- A. Water utilities
- B. Service meters
- C. Master meters
- D. Un-metered water users
- E. None of the Above

Meter Shop

264. Equipment used for meter calibration. Most meters will read lower than normal, never higher. All meters will create " _____ " on the water service except for a "Magnetic Meter".

- A. Velocity loss
- B. Service loss
- C. Master loss
- D. Head loss
- E. None of the Above

265. The large tanks are used to measure the water in gallons that is used to calibrate or check the _____.

- A. Calculation
- B. Service meters
- C. Master meters
- D. Water meter
- E. None of the Above

266. Most _____ will charge the customer a fee to check the accuracy of the meter.

- A. Water utilities
- B. Service meters
- C. Master meters
- D. Operators
- E. None of the Above

267. _____ are used to connect individual buildings or other plumbing systems to the distribution system mains.

- A. Treelike branches
- B. Service connections
- C. Service intervals
- D. Manifolds
- E. None of the Above

Tree System

268. Older water systems frequently were expanded without planning and developed into a _____ system. This consists of a single main that decreases in size as it leaves the source and progresses through the area originally served.

- A. Treelike
- B. Service connections
- C. Service intervals
- D. Manifolds
- E. None of the Above

269. Smaller pipelines branch off the main and divide again, much like the trunk and branches of a _____.

- A. Tree
- B. Service connections
- C. Service intervals
- D. Manifolds
- E. None of the Above

270. A _____ system is not desirable because the size of the old main limits the expansion of the system needed to meet increasing demands.

- A. Treelike
- B. Service connections
- C. Service intervals
- D. Manifolds
- E. None of the Above

271. There are many _____ in the system where water remains for long periods, causing undesirable tastes and odors in nearby service lines.

- A. Service connections
- B. Service intervals
- C. Manifolds
- D. Dead ends
- E. None of the Above

272. The most reliable means to provide water for _____ is by designing redundancy into the system.

- A. Water loss
- B. Fire fighting
- C. Regular leaks
- D. Friction loss calculation
- E. None of the Above

273. There are several advantages gained by laying out water mains in a loop or grid, with feeder and distributor mains interconnecting at roadway intersections and other _____.

- A. Mains
- B. Service connections
- C. Regular intervals
- D. Friction losses
- E. None of the Above

Friction Loss

274. Water will still be distributed through the system if a single section fails. The damaged section can be isolated and the remainder of the system will still _____.

- A. Be able to adjust
- B. Carry water
- C. Provide head
- D. Limit friction loss
- E. None of the Above

275. Water supplied to fire hydrants will feed from multiple directions. Thus during periods of peak fire flow demand, there will be less impact from " _____ " in water mains as the velocity within any given section of main will be less since several mains will be sharing the supply.

- A. Water hammer
- B. Jumping
- C. Crimping
- D. Friction loss
- E. None of the Above

Types of Pipes Used in the Distribution Field

Several types of pipe are used in water distribution systems, but only the most common types used by operators will be discussed. These piping materials include copper, plastic, galvanized steel, and cast iron.

Plastic Pipe (PVC)

276. This is currently the most common type of pipe used in _____. It is available in diameters of 1/2" and larger, and in lengths of 10', 20', and 40'.

- A. Easy installations
- B. Resistance issues
- C. C Factor concerns
- D. High temperatures
- E. None of the Above

277. A main advantage is its light weight, allowing for _____. A disadvantage is its inability to withstand shock loads.

- A. Easy installation
- B. Resistance issues
- C. C Factor concerns
- D. High temperatures
- E. None of the Above

278. Since it is _____, a tracer wire must be installed with the PVC water main so that it can be located after burial.

- A. Easily installed
- B. Resistant
- C. Non-metallic
- D. Rigid
- E. None of the Above

279. The National Sanitation Foundation (NSF) currently lists most brands of PVC pipe as being acceptable for potable water use. This information should be stamped on the outside of the pipe, along with working pressure and temperature, diameter and pipe manufacturer. PVC pipe will have the highest _____ of all the above pipes.

- A. Installation factor
- B. Resistance factor
- C. C Factor
- D. Temperature rating
- E. None of the Above

280. The higher the _____ the smoother the pipe.

- A. Installation factor
- B. Resistance factor
- C. C Factor
- D. Temperature rating
- E. None of the Above

281. Plastic pipe has seen _____ in current construction. Available in different lengths and sizes, it is lighter than steel or copper and requires no special tools to install.

- A. Easy installation
- B. Resistance
- C. Extensive use
- D. Temperature abuse
- E. None of the Above

282. Plastic pipe has several advantages over metal pipe. It is flexible, it has superior resistance to rupture from freezing, it has complete _____ to corrosion and in addition, it can be installed above ground or below ground.

- A. Installation
- B. Resistance
- C. Compaction
- D. Destruction
- E. None of the Above

283. One of the most _____ plastic and polyvinyl resin pipes is the polyvinyl chloride (PVC). PVC pipes are made of tough, strong thermoplastic material that has an excellent combination of physical and chemical properties.

- A. Easy to install
- B. Resistant
- C. Versatile
- D. Strongest
- E. None of the Above

284. Its chemical _____ and design strength make it an excellent material for application in various mechanical systems.

- A. Composition
- B. Resistance
- C. Residue
- D. Structure
- E. None of the Above

285. Sometimes polyvinyl chloride is further chlorinated to obtain a stiffer design, a higher level of impact resistance, and a greater resistance to extremes of _____.

- A. Composition
- B. Resistance
- C. Residue
- D. Temperature
- E. None of the Above

286. A CPVC pipe (a chlorinated blend of PVC) can be used not only in cold-water systems, but also in hot-water systems with _____ up to 210°F.

- A. Composition
- B. Resistance
- C. C Factor
- D. Temperatures
- E. None of the Above

287. _____ of installation make plastic pipe popular for use in either water distribution and supply systems or sewer drainage systems.

- A. Economy and ease
- B. Resistance
- C. C Factor
- D. Temperatures
- E. None of the Above

Cast Iron (CIP)

288. This is another type of _____ that has been in use for a long time. It is found in diameters from 3" to 48".

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation concern
- D. Corrosion problems concern
- E. None of the Above

289. Advantages of this material are its long life, _____ and ability to withstand working pressures up to 350 psi.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation issues
- D. Corrosion problems concerns
- E. None of the Above

290. _____ include the fact that it is heavy, difficult to install and does not withstand shock loading. Although it is not currently the material of choice, there is still a lot of it in the ground.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation issues
- D. Corrosion problems concerns
- E. None of the Above

Ductile Iron Pipe (DIP)

291. This was developed to overcome the _____ associated with cast iron pipe. It can be purchased in 4" to 45" diameters and lengths of 18' to 20'.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation concerns
- D. Corrosion problems and related issues
- E. None of the Above

292. Its main _____ is that it is nearly indestructible by internal or external pressures. It is manufactured by injecting magnesium into molten cast iron.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation concern
- D. Corrosion issue
- E. None of the Above

293. It is sometimes protected from highly corrosive soils by wrapping the pipe in plastic sheeting prior to _____. This practice can greatly extend the life of this type of pipe.

- A. Shipping
- B. Use
- C. Installation
- D. Corrosion
- E. None of the Above

Steel Pipe

294. This pipe is often used in _____ and pump stations. It is available in various diameters and in 20' or 21' lengths.

- A. Standpipes
- B. Underwater
- C. Installation zones
- D. Corrosion zones
- E. None of the Above

295. Its main advantage is the ability to form it into a variety of shapes. It also exhibits good yielding and _____.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation
- D. Corrosion problems
- E. None of the Above

296. It has a smooth interior surface and can withstand pressures up to 250 psi. A(n) _____ is that it is easily corroded by both soil and water.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation problem
- D. Cost issue
- E. None of the Above

297. To reduce _____, steel pipe is usually galvanized or dipped in coal-tar enamel and wrapped with coal-tar impregnated felt.

- A. Weight
- B. Manpower hours
- C. Installation costs
- D. Corrosion problems
- E. None of the Above

298. At present, coal-tar products are undergoing scrutiny from a(n) _____ and it is recommended that the appropriate regulatory agencies be contacted prior to use of this material.

- A. Guideline
- B. Procedure
- C. Installation concern
- D. Corrosion issue
- E. None of the Above

Asbestos Cement Pipe (ACP)

299. This pipe is manufactured from Portland cement, long fibrous asbestos and silica. It is _____ from 3" to 36" and in 13' lengths.

- A. Advantageous and is available
- B. Disadvantageous and is available
- C. Installed
- D. Available in diameters
- E. None of the Above

300. Its main _____ are its ability to withstand corrosion and its excellent hydraulic flow characteristics due to its smoothness.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation concerns
- D. Corrosion problems
- E. None of the Above

301. A major _____ is that it is brittle and is easily broken during construction or by shock loading. There is some concern regarding the possible release of asbestos fibers in corrosive water and there has been much debate over the health effects of ingested asbestos.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation concern
- D. Corrosion problem
- E. None of the Above

302. Of greater certainty, however, is the danger posed by inhalation of asbestos fibers. Asbestos is considered a hazardous material, and _____ must be taken to protect water utility workers when cutting, tapping or otherwise handling this type of pipe.

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation
- D. Precautionary measures
- E. None of the Above

Galvanized Pipe

303. Galvanized pipe is _____ for the water distributing pipes inside a building to supply hot and cold water to the fixtures.

- A. Nominal inside diameters
- B. Commonly used
- C. Resist corrosion
- D. Threaded for standard fittings
- E. None of the Above

304. This type of pipe is manufactured in 21-ft lengths. It is galvanized (coated with zinc) both _____ at the factory to resist corrosion.

- A. Nominal inside and outside diameters
- B. Inside and outside
- C. Resist corrosion inside and outside
- D. Threaded for standard fittings
- E. None of the Above

305. Pipe sizes are based on _____. Inside diameters vary with the thickness of the pipe.

- A. Nominal inside diameters
- B. Commonly used sizes
- C. American sizes
- D. Threaded for standard fittings
- E. None of the Above

306. Outside diameters remain constant so that pipe can be _____.

- A. Tapered for inside diameters
- B. Commonly used
- C. Corrosion resistant
- D. Threaded for standard fittings
- E. None of the Above

Copper Pipe or Tubing

Copper is one of the most widely used materials for tubing.

307. This is because it does not rust and is highly resistant to any accumulation of scale particles in the pipe. This _____ is available in three different types: K, L, and M.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

308. K has the thickest walls, and M, the thinnest walls, with L's thickness in between the other two. The thin walls of copper _____ are soldered to copper fittings.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

309. Soldering allows all the _____ and fittings to be set in place before the joints are finished. Generally, faster installation will be the result.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

310. Type K copper tubing is available in either rigid (hard temper) or flexible (_____) and is primarily used for underground service in the water distribution systems.

- A. Soft temper
- B. Tubing
- C. Type L
- D. None of the Above

311. _____ tubing is available in 40- or 60-ft coils, while hard temper tubing comes in 12- and 20-ft straight lengths.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

312. _____ copper tubing is also available in either hard or soft temper and either in coils or in straight lengths.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

313. The _____ tubing is often used as replacement plumbing because of the tube's flexibility, which allows easier installation.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

314. _____ copper tubing is widely used in water distribution systems.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

315. Type M copper tubing is made in _____ and is available in straight lengths of 12 and 20 ft.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

316. It has a thin wall and is used for branch supplies where water pressure is low, but it is NOT used for mains and risers. It is also used for chilled water systems, for exposed lines in hot-water heating systems, and for _____.

- A. Soft temper
- B. Tubing
- C. Type L
- D. Drainage piping
- E. None of the Above

Joins and Fittings

317. _____ vary according to the type of piping material used. The major types commonly used in water service include elbows, tees, unions, couplings, caps, plugs, nipples, reducers, and adapters.

- A. Screwed joints
- B. Fittings
- C. Male thread
- D. Reducer
- E. None of the Above

318. Besides bell-and-spigot joints, cast-iron water pipes and fittings are made with either flanged, mechanical, or _____. The screwed joints are used only on small-diameter pipe.

- A. Screwed joints
- B. Fittings
- C. Male thread fittings
- D. Reducer fittings
- E. None of the Above

Tapping Sleeve

319. Customers are not inconvenienced by having their water turned off is one of the reason we utilize _____ or hot taps.

- A. Screwed joints
- B. Male thread fittings
- C. Reducer fittings
- D. Pressure taps
- E. None of the Above

320. A Gate Valve is used to isolate sections of _____. Not to be used to throttle or regulate the flow.

- A. Screwed joints
- B. Fittings
- C. Water mains
- D. Service connections
- E. None of the Above

321. A Globe valve should be used to regulate the flow. Be sure to chlorinate or disinfect all distribution parts such as _____!

- A. Screwed joints
- B. Fittings
- C. Valves and piping
- D. Reducers
- E. None of the Above

Caps

322. A _____ is a couplings with a female (inside) thread. It is used like a plug, except that the pipe cap screws on the male thread of a pipe or nipple.

- A. Screwed joints
- B. Fitting
- C. Male thread
- D. Pipe cap
- E. None of the Above

Couplings

323. The three common types of _____ are straight coupling, reducer, and eccentric reducer.

- A. Screwed joints
- B. Couplings
- C. Male threads
- D. Reducers
- E. None of the Above

324. The straight _____ is for joining two lengths of pipe in a straight run that do not require additional fittings. A run is that portion of a pipe or fitting continuing in a straight line in the direction of flow.

- A. Screwed joint
- B. Tee
- C. Male adapter
- D. Reducer
- E. None of the Above

325. A _____ is used to join two pipes of different sizes.

- A. Screwed joint
- B. Fitting
- C. Male Straight
- D. Reducer
- E. None of the Above

326. The eccentric _____ (also called a bell reducer) has two female (inside) threads of different sizes with centers so designed that when they are joined, the two pieces of pipe will not be in line with each other, but they can be installed to provide optimum drainage of the line.

- A. Screwed joint
- B. Fitting
- C. Male Straight
- D. Reducer
- E. None of the Above

Elbows (Or Ells) 90° AND 45°

327. These fittings are used to change the _____ either 90 or 45 degrees.

- A. Dissimilar metals
- B. Galvanization
- C. Street elbows
- D. Male thread
- E. None of the Above

328. _____ have female threads at both outlets.

- A. Dissimilar elbows
- B. Nipples
- C. Regular elbows
- D. Male Straights
- E. None of the Above

329. _____ change the direction of a pipe in a close space where it would be impossible or impractical to use an elbow and nipple.

- A. Dissimilar elbows
- B. Female Straights
- C. Street elbows
- D. Male Straights
- E. None of the Above

330. Both 45 and 90-degree _____ are available with one female and one male threaded end. The reducing elbow is similar to the 90-degree elbow except that one opening is smaller than the other is.

- A. Dissimilar elbows
- B. Female Straights
- C. Street elbows
- D. Male Straights
- E. None of the Above

Nipples

331. A nipple is a short length of pipe (12 in. or less) with a male thread on each end. It is used for extension from a fitting. At times, you may use the _____ or insulating type of fittings.

- A. Dielectric
- B. Galvanized
- C. Street
- D. Male
- E. None of the Above

332. These fittings connect underground tanks or hot-water tanks. They are also used with pipes of _____.

- A. Dissimilar metals
- B. Galvanization
- C. Right angles
- D. Male thread
- E. None of the Above

333. These help slow down _____ that starts inside the pipe and works to the outside of the pipe.

- A. Dissimilar metal rust
- B. Galvanization
- C. Flow
- D. Corrosion
- E. None of the Above

334. Do not heat or solder _____. You may melt the plastic coating on them.

- A. Dielectric fittings
- B. Galvanized
- C. Street elbows
- D. Male thread fittings
- E. None of the Above

335. Zinc is a coating on the outside and inside of pipes to slow corrosion. This process is called "_____".

- A. Dissimilar metals
- B. Galvanization
- C. Rust
- D. Male pattern
- E. None of the Above

Tees

336. A tee is used for connecting pipes of different diameters or for changing the direction of pipe runs. A common type of pipe tee is the _____, which has a straight-through portion and a 90-degree takeoff on one side. All three openings of the straight tee are of the same size.

- A. Straight tee
- B. Reducing tee
- C. Ground joint union
- D. Pipe
- E. None of the Above

337. Another common type is the _____, similar to the straight tee just described, except that one of the threaded openings is of a different size than the other.

- A. Straight tee
- B. Reducing tee
- C. Ground joint union
- D. Pipe
- E. None of the Above

Unions

338. There are two types of _____. The ground joint union consists of three pieces, and the flange union is made in two parts. Both types are used for joining two pipes together and are designed so that they can be disconnected easily.

- A. Straight tee
- B. Reducing tee
- C. Ground joint union
- D. Pipe unions
- E. None of the Above

339. When joined, the two pieces of _____ will not be in line with each other, but they can be installed to provide optimum drainage of the line.

- A. Straight tee
- B. Reducing tee
- C. Ground joint union
- D. Pipe
- E. None of the Above

Disinfection of Repaired Pipeline Sections

340. You should recognize that the protection of the public health of its water customers is the primary role of a _____.

- A. Distribution service worker
- B. Valveman
- C. Water provider
- D. Emergency repair worker
- E. None of the Above

341. The _____ of all repaired water appurtenances is paramount to the return of the water system to its' normal operation mode.

- A. Distribution lines
- B. Assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

342. Prior to initiating the _____ process, a thorough cleaning of all repaired pipes and or reservoirs must be accomplished.

- A. Distribution lines
- B. Assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

Spare Parts Inventory

343. You should maintain a _____ of spare parts for the maintenance and repair of all water transmission and distribution lines.

- A. Distribution lines
- B. Helicopter
- C. Complete inventory
- D. Emergency repair
- E. None of the Above

344. The _____ in the system range in size between $\frac{3}{4}$ inch and 16 inches in diameter.

- A. Water lines
- B. Fire hydrants
- C. Disinfection equipment
- D. Emergency repair section
- E. None of the Above

345. You should maintain _____, pump ends, and motors for all wells and booster stations.

- A. Distribution lines
- B. Rifles
- C. Disinfection equipment
- D. Emergency repair screws
- E. None of the Above

346. Water system personnel can repair the entire range of water lines _____ from outside contractors.

- A. In the distribution lines
- B. Without assistance
- C. Disinfection
- D. Emergency repairs
- E. None of the Above

347. Stand-by warehouse personnel should be available twenty four hours per day to assist in the delivery of spare parts in instances requiring _____.

- A. Distribution lines
- B. Assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

Preventative Maintenance (PM)

348. Preventative maintenance can _____ the life of any water pipeline.

- A. Complete
- B. Undermine
- C. Deteriorate
- D. Provide
- E. None of the Above

349. Pipes can deteriorate on the inside as a result of _____ and on the outside as a result of aggressive soil and moisture.

- A. Corrosion
- B. Years
- C. Deterioration
- D. Water hammer
- E. None of the Above

350. The Water Department should maintain an intense leak detection program to _____ reduce operating costs and provide revenue savings by reducing lost and unaccounted for water.

- A. Find corrosion
- B. Undermine and
- C. Effectively
- D. Accordingly
- E. None of the Above

351. Leaks can originate in joints and fittings or any _____, portion of a pipeline. Additionally, leaks will undermine the pavement and water soak the area around the leaking section of pipeline.

- A. Corroded
- B. Undermined
- C. Deteriorated
- D. City
- E. None of the Above

352. When leaks are _____, they are repaired within twenty four hours after properly locating all underground utilities through the Underground Service Alert or "Blue Stake" procedure.

- A. Leaking
- B. Discovered
- C. Blowing
- D. Taken
- E. None of the Above

Water Main Installation

353. _____ of new or replacement pipe sections should be in accordance with good construction practices.

- A. Thrust blocking
- B. Ground surface area
- C. Installation
- D. Good construction practices
- E. None of the Above

354. The line must be _____ a minimum of 30" below the ground surface to prevent freezing.

- A. Buried
- B. Under surfaces
- C. Bedded and backfilled
- D. Constructed even
- E. None of the Above

355. The line must be _____ properly insuring protection from weather and surface loadings.

- A. Thrust blocked
- B. Ground surface
- C. Bedded and backfilled
- D. In good construction practices
- E. None of the Above

356. Thrust blocking (Kickers) at all bends, tees, and valves is essential to hold the pipe in place and prevent _____.

- A. Separation of line sections
- B. Ground surface egress
- C. Bedded and backfilled
- D. Gopher attacks
- E. None of the Above

357. _____ is not necessary if the pipe is welded.

- A. Thrust blocking
- B. Ground surface tapping
- C. Bedding and backfilled
- D. Good construction practice
- E. None of the Above

358. _____ of new installations or repaired sections is required prior to placing them in service. This can be accomplished by filling the line with a 25 mg/1 free chlorine solution and allowing it to stand for 24 hours.

- A. Thrust blocking
- B. Ground surface
- C. Bedding and backfilling
- D. Good construction practices
- E. None of the Above

359. Valves and fittings used in the _____ are made of cast iron, steel, brass, stainless and fiberglass.

- A. Minimal service disruption
- B. Remove accumulated sediment
- C. Installed at high points
- D. On dead end lines
- E. None of the Above

360. Enough gate valves should be placed throughout the system to enable problem areas (leaks, etc.) to be _____ with minimal service disruption.

- A. Minimal service disruptions
- B. Remove accumulated sediment
- C. Installed at high points
- D. Isolated and repaired
- E. None of the Above

361. Air relief valves should be _____ in the system.

- A. Minimal service disruption
- B. Remove accumulated sediment
- C. Installed at high points
- D. On dead end lines
- E. None of the Above

362. Valves should be installed with _____.

- A. Minimal service disruption
- B. Remove accumulated sediment
- C. Installed at high points
- D. On dead end lines
- E. None of the Above

363. Regardless of the type of pipe installed, certain maintenance routines should be performed on the distribution system to _____. These programs should be scheduled and performed on a regular basis.

- A. Minimal service disruption
- B. Remove accumulated sediment
- C. Installed at high points
- D. Maintain water quality and optimal service
- E. None of the Above

364. _____ on dead end lines and at fire hydrants throughout the system should be done at least twice per year.

- A. Minimal service disruption
- B. Remove accumulated sediment
- C. Installed at high points
- D. On dead end lines
- E. None of the Above

365. Flushing is needed to _____ in dead ends and to remove accumulated sediment that results from turbidity, iron, manganese, etc.

- A. Minimal service disruption
- B. Remove stagnant water
- C. Installed at high points
- D. On dead end lines
- E. None of the Above

366. This should also help _____. Flushing should always be done from the source to the ends of the system.

- A. Pressure tests
- B. Constant evaluation of the system
- C. Minimize customer complaints of water quality
- D. Determine if pipe capacity
- E. None of the Above

367. Affected customers should be notified of this process in advance. To do an adequate job of flushing, the flow should reach a velocity of at least 2.5 feet per second, known as the "_____” of the system (at hydrant locations).

- A. Pressure tests
- B. Evaluation
- C. Minimum cleansing velocity
- D. Pipe capacity
- E. None of the Above

368. These tests are important to determine the adequacy of the distribution system in _____ particularly during days of peak demand.

- A. Pressure tests
- B. Evaluating the system
- C. Compaction tests
- D. Pipe capacity
- E. None of the Above

369. These tests can help determine if pipe capacity is decreasing over time due to _____ or deposits.

- A. Pressure tests
- B. Constant evaluation
- C. Minimum cleansing velocity
- D. Internal corrosion
- E. None of the Above

370. _____ should be done at various locations in the distribution system several times per year.

- A. Pressure tests
- B. Constant evaluation of the system
- C. Minimum cleansing velocity
- D. Determining pipe capacity
- E. None of the Above

371. This helps to _____ of the system and alert the operator to problems such as leaks or internal deposits.

- A. Monitor the performance
- B. Constantly evaluate
- C. Cleanse and check the velocity
- D. Determine the pipe capacity
- E. None of the Above

372. It is sometimes advantageous to have certain points in the system continuously monitored to provide a _____.

- A. Pressure tests
- B. Constant evaluation of the system
- C. Minimum cleansing velocity
- D. Determine if pipe capacity
- E. None of the Above

Cross-connection

373. A cross-connection is any temporary or permanent connection between a public water system or consumer's potable (i.e., drinking) water system and any source or system containing _____ water or other substances.

- A. Backsiphonage
- B. Backpressure
- C. Nonpotable
- D. Downstream pressure
- E. None of the Above

374. An example is the piping between a public water system or consumer's potable water system and a(n) _____, cooling system, or irrigation system.

- A. Backsiphonage
- B. Backpressure
- C. Nonpotable
- D. Downstream pressure
- E. None of the Above

375. _____: Any natural or man-made physical, chemical, biological, or radiological substance or matter in water, which is at a level that may have an adverse effect on public health, and which is known or anticipated to occur in public water systems.

- A. CONTAMINANT
- B. CONTAMINATION
- C. CORROSION
- D. CROSS-CONNECTION
- E. None of the Above

376. _____: To make something bad. To pollute or infect something. To reduce the quality of the potable (drinking) water and create an actual hazard to the water supply by poisoning or through spread of diseases.

- A. CONTAMINANT
- B. CONTAMINATION
- C. CORROSION
- D. CROSS-CONNECTION
- E. None of the Above

377. _____: The removal of metal from copper, other metal surfaces and concrete surfaces in a destructive manner. Corrosion is caused by improperly balanced water or excessive water velocity through piping or heat exchangers.

- A. CONTAMINANT
- B. CONTAMINATION
- C. CORROSION
- D. CROSS-CONNECTION
- E. None of the Above

378. _____: A physical connection between a public water system and any source of water or other substance that may lead to contamination of the water provided by the public water system through backflow. This also might be the source of an organic substance causing taste and odor problems in a water distribution system.

- A. CONTAMINANT
- B. CONTAMINATION
- C. CORROSION
- D. CROSS-CONNECTION
- E. None of the Above

379. _____: The mixing of two unlike qualities of water. For example, the mixing of good water with a polluting substance like a chemical substance.

- A. CONTAMINANT
- B. CONTAMINATION
- C. CORROSION
- D. CROSS-CONTAMINATION
- E. None of the Above

Backflow

380. Backflow is the undesirable reversal of flow of nonpotable water or other substances through a cross-connection and into the piping of a public water system or consumer's potable water system. There are two types of backflow--backpressure and _____.

- A. Backsiphonage
- B. Backpressure
- C. Nonpotable
- D. Downstream pressure
- E. None of the Above

Backsiphonage

381. Backsiphonage is backflow caused by a negative pressure (i.e., a vacuum or partial vacuum) in a public water system or consumer's _____ water system.

- A. Backsiphonage
- B. Backpressure
- C. Potable
- D. Downstream pressure
- E. None of the Above

382. Backsiphonage can occur when there is a stoppage of water supply due to nearby fire fighting, a break in a water main, etc. Hoses are the greatest source of _____ problems.

- A. Backsiphonage
- B. Backpressure
- C. Nonpotable waterworks industry
- D. Downstream pressure
- E. None of the Above

Backpressure

383. Backpressure is backflow caused by a _____ that is greater than the upstream or supply pressure in a public water system or consumer's potable water system.

- A. Backsiphonage
- B. Cross-Connections
- C. Nonpotable waterworks industry
- D. Downstream pressure
- E. None of the Above

384. Backpressure (i.e., downstream pressure that is greater than the potable water supply pressure) can result from an increase in _____, a reduction in the potable water supply pressure, or a combination of both.

- A. Backsiphonage
- B. Backpressure
- C. Cross-Connections
- D. Downstream pressure
- E. None of the Above

385. Increases in _____ can be created by pumps, temperature increases in boilers, elevation, etc.

- A. Backsiphonage
- B. Backpressure
- C. Cross-Connections
- D. Downstream pressure
- E. None of the Above

386. Reductions in _____ water supply pressure occur whenever the amount of water being used exceeds the amount of water being supplied, such as during water line flushing, fire fighting, or breaks in water mains.

- A. Backsiphonage
- B. Backpressure
- C. Potable
- D. Downstream pressure
- E. None of the Above

Backflow Review Statements

387. What is a continuous positive pressure in a distribution system is essential for preventing a backflow condition or event?

- A. Backflow Condition
- B. Backflow Prevention
- C. Backflow or Cross-connection Failure
- D. Backflow
- E. None of the Above

388. What might be the source of an organic substance causing taste and odor problems in a water distribution system?

- A. Backflow Condition
- B. Backflow Prevention
- C. Backflow or Cross-connection failure
- D. Backflow
- E. None of the Above

389. To stop or prevent the occurrence of, the unnatural act of reversing the normal direction of the flow of liquid, gases, or solid substances back in to the public potable (drinking) water supply.

- A. Backflow Condition
- B. Backflow Prevention
- C. Backflow or Cross-connection Failure
- D. Backflow
- E. None of the Above

390. Minimum water pressure must be maintained to ensure adequate customer service during peak flow periods. However minimum positive pressure must be maintained in mains to protect against backflow or backsiphonage from cross-connections.

- A. Backflow Condition
- B. Backflow Prevention
- C. Backflow or Cross-connection Failure
- D. Backflow
- E. None of the Above

391. Name the most common CAUSE for public water supply contamination. Backflow or cross-connection. To reverse the natural and normal directional flow of a liquid, gases, or solid substances back into the public potable (drinking) water supply. This is normally an undesirable effect.

- A. Backflow Condition
- B. Backflow Prevention
- C. Backflow or Cross-connection Failure
- D. Backflow
- E. None of the Above

392. What does a backsiphonage condition usually cause?

- A. It must be at least 12 inches above the highest downstream outlet.
- B. Reduced pressure or negative pressure on the service or supply side.
- C. The RP has a relief valve.
- D. A cross-connection.
- E. None of the Above

393. What does a double check valve backflow assembly provide effective protection from?

- A. It must be at least 12 inches above the highest downstream outlet.
- B. Both backpressure and backsiphonage of pollution only.
- C. The RP has a relief valve.
- D. A cross-connection.
- E. None of the Above

394. What is equipment that utilizes water for cooling, lubrication, washing or as a solvent always susceptible to?

- A. It must be at least 12 inches above the highest downstream outlet.
- B. 1 year.
- C. The RP has a relief valve.
- D. A cross-connection.
- E. None of the Above

395. What is the difference between a reduced pressure principle backflow device and a double check backflow device?

- A. It must be at least 12 inches above the highest downstream outlet.
- B. 1 year.
- C. The RP has a relief valve.
- D. A cross-connection.
- E. None of the Above

396. What is the maximum time period between having a backflow device tested by a certified backflow tester?

- A. It must be at least 12 inches above the highest downstream outlet.
- B. 1 year.
- C. The RP has a relief valve.
- D. A cross-connection.
- E. None of the Above

397. What must an operator ensure when installing a pressure vacuum breaker backflow device?
- A. It must be at least 12 inches above the highest downstream outlet.
 - B. 1 year.
 - C. The RP has a relief valve.
 - D. A cross-connection.
 - E. None of the Above

398. An example is the piping between a public water system or consumer's potable water system and a(n) _____, cooling system, or irrigation system.
- A. Backsiphonage situation
 - B. Backpressure situation
 - C. Nonpotable connection
 - D. Potential downstream pressure
 - E. None of the Above

Approved Air Gap Separation (AG)

399. An approved air gap is a(n) _____ between the free flowing discharge end of a potable water supply pipeline, and the overflow rim of an open or non pressure receiving vessel.
- A. Physical separation
 - B. Air flow is restricted
 - C. Least twice the inside diameter of the inlet pipe
 - D. Obstruction
 - E. None of the Above

400. These separations must be _____ a distance of at least twice the inside diameter of the inlet pipe, but never less than one inch.
- A. Air gap
 - B. Gapped
 - C. Least twice the inside diameter of the inlet pipe
 - D. No obstruction
 - E. None of the Above

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