

Registration form

**WATER MAINS AND SERVICE CONNECTIONS \$100.00
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

Start and finish dates: _____
You will have 90 days from this date in order to complete this course

Name _____ Signature _____
I have read and understood the disclaimer notice on page 2. Digitally sign XXX

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Your certificate will be mailed to you in about two weeks.

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Water Treatment _____ Distribution _____ Collection _____ Wastewater Treatment _____
Onsite Installer _____ Other _____

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DISCLAIMER NOTICE

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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.

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.

Thank you...

Water Mains Answer Key

Name _____

Phone # _____

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

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Please fax or e-mail the answer key to TLC
Western Campus Fax (928) 272-0747.

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.

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.

Thank you...

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

**WATER MAINS CEU COURSE
CUSTOMER SERVICE RESPONSE CARD**

NAME: _____

E-MAIL _____ PHONE _____

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

1. Please rate the difficulty of your course.
Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.
Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.
Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

How about the price of the course?

Poor _____ Fair _____ Average _____ Good _____ Great _____

How was your customer service?

Poor _____ Fair _____ Average _____ Good _____ Great _____

Any other concerns or comments.

Water Mains CEU Training Course Assignment

The Water Mains and Service Connections 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.

Water Use or Demand

1. Water system demand comes from a _____ 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

2. 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

3. 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
 - E. None of the Above

4. 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. None of the Above

5. 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 pressure
 - B. Unavoidable loss and waste
 - C. Maximum daily use
 - D. Rather significant
 - E. None of the Above

Water Pressure

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

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

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

- A. Minimum required
- B. Commercial and industrial districts
- C. Supplying water
- D. Usually adequate
- E. None of the Above

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

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

9. 20 psi is considered the minimum required at any point in the water system, so that backflow and _____.

- A. Infiltration is prevented
- B. Commercial and industrial districts
- C. Supplying water
- D. On-going maintenance costs
- E. None of the Above

10. 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. Minimum required
- B. Commercial and industrial districts
- C. Supplying water
- D. Direct force
- E. None of the Above

Storage and Distribution

11. 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

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

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

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

- A. Protect water quality
- B. Aware of this phenomenon
- C. Pressure potential energy
- D. Maintaining system integrity
- E. None of the Above

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

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

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

- A. Interruptions of construction
- B. Aware of this phenomenon
- C. Pressure potential energy
- D. Maintaining system integrity
- E. None of the Above

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

- A. Water distribution systems
- B. Aware of this phenomenon
- C. Pressure potential energy
- D. Maintaining system integrity
- E. None of the Above

Water Storage Facilities

17. 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. Water distribution systems
- B. Size, shape, and application
- C. Pressure potential energy
- D. None of the Above

Surge Tanks

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

- A. Water distribution systems
- B. Aware of this phenomenon
- C. Pressure potential energy
- D. Water main breaks
- E. None of the Above

19. 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 systems
 - B. Trapping the kinetic energy
 - C. Pressure potential energy
 - D. Maintaining system integrity
 - E. None of the Above
20. _____ 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 system integrity
 - E. None of the Above
21. 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 systems
 - B. Release the surge
 - C. Pressure potential energy
 - D. Maintaining system integrity
 - E. None of the Above
22. A Surge tank should not be used for _____.
- A. Stored energy
 - B. Store water high
 - C. Water storage
 - D. Storage be equal
 - E. None of the Above
23. 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. Water storage
 - D. Storage be equal
 - E. None of the Above
24. This _____ can be converted to pressure potential energy or kinetic energy for delivery to homes.
- A. Stored energy
 - B. Store water high
 - C. Water storage
 - D. None of the Above
25. 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 be equal
 - E. None of the Above

Storage Reservoirs

26. 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

27. It is also recommended that storage reservoirs be located at a high enough elevation to allow the water to _____ to the distribution system.

- A. Stored energy
- B. Store water high
- C. Flow by gravity
- D. Storage be equal
- E. None of the Above

28. 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. Apparently degraded
- D. Lower construction
- E. None of the Above

29. Reservoirs are also used as detention basins to provide the required chlorine contact time necessary to ensure the _____.

- A. Pump failure
- B. Adequacy of disinfection
- C. Apparently degraded
- D. Lower construction
- E. None of the Above

30. 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. Opposite sides
- C. Apparently degraded
- D. Lower construction
- E. None of the Above

31. 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. Pump failure
- B. Opposite sides
- C. Apparently degraded
- D. Short-circuiting
- E. None of the Above

Steel Reservoirs

32. Steel reservoirs or tanks generally have lower construction and installation costs than concrete, but _____.
- A. Require more maintenance
 - B. Opposite sides
 - C. Apparently degraded
 - D. Lower construction
 - E. None of the Above
33. 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. Pump failure
 - B. Commonly coated
 - C. Apparently degraded
 - D. Lower construction
 - E. None of the Above
34. 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. Pump failure
 - B. Amounts of solvents
 - C. Apparently degraded
 - D. Lower construction
 - E. None of the Above
35. 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. Pump failure
 - B. Opposite sides
 - C. Apparently degraded
 - D. Manufactured off-site
 - E. None of the Above
36. Steel tanks should be inspected once a year and _____ every 5-7 years.
- A. Repainted
 - B. Opposite sides
 - C. Apparently degraded
 - D. Lower construction
 - E. None of the Above
37. 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. Pump failure
 - B. Annual draining
 - C. Apparently degraded
 - D. Lower construction
 - E. None of the Above
38. Cleaning and disinfection _____ the reservoir or tank back in service is necessary.
- A. Pump failure
 - B. Opposite sides
 - C. Prior to placing
 - D. Lower construction
 - E. None of the Above

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

39. Fill the tank or reservoir with a 25 mg/1 _____ and leave it for 24 hours.
- A. Chlorine solution
 - B. Chlorinated water
 - C. Advantages and disadvantages
 - D. Corrosion resistant exteriors
 - E. None of the Above
40. Fill the reservoir with a 50 mg/1 _____ and leave it for 3 hours.
- A. Chlorine solution
 - B. Chlorinated water
 - C. Advantages and disadvantages
 - D. Corrosion resistant exteriors
 - E. None of the Above
41. Spray or brush on a 200 mg/1 _____ and allow it to remain for 3 hours.
- A. Chlorine solution
 - B. Chlorinated water
 - C. Advantages and disadvantages
 - D. Corrosion resistant exteriors
 - E. None of the Above
42. 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. Advantages and disadvantages
 - D. Corrosion resistant exteriors
 - E. None of the Above
43. 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. Possible to reduce the time
 - B. Service for maintenance
 - C. Advantages and disadvantages
 - D. Corrosion resistant exteriors
 - E. None of the Above
44. 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. Possible to reduce the time
 - B. Service for maintenance
 - C. Advantages and disadvantages
 - D. Corrosion resistant exteriors
 - E. None of the Above

Hydropneumatic Tank Section

Effects on the Water Supply

45. 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. Possible to reduce the time
- B. Service for maintenance
- C. Advantages and disadvantages
- D. Corrosion resistant exteriors
- E. None of the Above

46. 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. Hydropneumatic tank
- C. Individuals
- D. Customers
- E. None of the Above

Troubleshooting Hydropneumatic Tank Problems

47. The purpose of a _____ 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. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

48. 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. Hydropneumatic tank
- C. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

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

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

50. 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. Hydropneumatic tank
- C. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

Distribution Valves

51. 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. Interrupting the supply
- C. Valve
- D. Vault or manhole
- E. None of the Above

52. _____ 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. Installing shutoff valves
- B. Interrupting the supply
- C. Valves
- D. Vault or manhole
- E. None of the Above

53. 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. Installing shutoff valves
- B. Interrupting the supply
- C. Valve
- D. Branch mains
- E. None of the Above

54. 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. Installing shutoff valves
- B. Interrupting the supply
- C. Valve spacing
- D. Vault or manhole
- E. None of the Above

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

- A. Installing shutoff valves
- B. Interrupting the supply
- C. Valves
- D. Vault or manhole
- E. None of the Above

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

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

57. 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

58. 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. Installing shutoff valves
- B. Interrupting the supply
- C. Valve
- D. Vault or manhole
- E. None of the Above

Classification of Valves

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

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

Gate Valve Linear Valve Our primary Linear valve

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

- A. Installing shutoff valves
- B. Interrupting the supply
- C. Main line shut downs
- D. Vault or manhole
- E. None of the Above

61. _____ 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. Vault or manhole
- E. None of the Above

62. _____ 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. Vault or manhole
- E. None of the Above

63. 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 drop
 - C. Gate valve
 - D. Vault or manhole
 - E. None of the Above
64. 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. Gate valve
 - D. Vault or manhole
 - E. None of the Above
65. Therefore, there is little _____ or flow restriction through the valve. Gate valves are not suitable for throttling purposes.
- A. Wedge-shaped
 - B. Pressure drop
 - C. Gate valve
 - D. Vault or manhole
 - E. None of the Above
66. 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. Shut the water off
 - B. Specifically authorized
 - C. Create a water hammer
 - D. Control of flow
 - E. None of the Above
67. Except as specifically authorized, gate valves _____.
- A. Shut the water off
 - B. Should not be used for throttling
 - C. Create a water hammer
 - D. Jammed-tight
 - E. None of the Above
68. 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. Specifically authorized
 - C. Create a water hammer
 - D. Jammed-tight
 - E. None of the Above
69. 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. Specifically authorized
 - C. Create a water hammer
 - D. Jammed-tight
 - E. None of the Above

Problems

Valve Jammed Open

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

- A. Shut the water off
- B. Specifically authorized
- C. Create a water hammer
- D. Jammed-tight
- E. None of the Above

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

- A. Back seated
- B. Torque applied
- C. Working fluid
- D. Quarter turn
- E. None of the Above

72. 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. Torque applied
- C. Working fluid
- D. Valve sealing
- E. None of the Above

Valve Jammed Closed

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

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

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

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

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

- A. Back seated
- B. Torque applied
- C. Working fluid
- D. Valve sealing
- E. None of the Above

76. 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 seated
- B. Torque applied
- C. Over-pressurization
- D. Valve sealing
- E. None of the Above

If Excessive Torque is Needed to Work the Valve

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

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

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

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

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

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

80. 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 seated
- B. Torque applied
- C. Thermal binding
- D. Over-pressurization
- E. None of the Above

81. 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 seated
- B. Torque applied
- C. Thermal binding
- D. Pressure equalizer
- E. None of the Above

Globe Valve Rotary Valve

82. 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 safety procedures
- C. Renewable seat ring
- D. Economical flow control
- E. None of the Above

83. Always follow _____ when working on a valve.
- A. Flow regulation
 - B. Standard safety procedures
 - C. Renewable seat ring
 - D. Economical flow control
 - E. None of the Above
84. Most Globes have compact OS & Y type, bolted bonnet, rising stem, with _____ valves.
- A. Flow regulation
 - B. Standard safety procedures
 - C. Renewable seat ring
 - D. Economical flow control
 - E. None of the Above
85. A Check Valve spring loaded disc resulting with most advanced design features provides the ultimate in dependable, _____.
- A. Flow regulation
 - B. Standard safety procedures
 - C. Renewable seat ring
 - D. Economical flow control
 - E. None of the Above
86. Globe valves should usually be installed with the inlet below the valve _____.
- A. Stem
 - B. Valves
 - C. Packings
 - D. Seat
 - E. None of the Above
87. 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
 - B. Throttling service
 - C. Packings
 - D. Upright
 - E. None of the Above
88. 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. Valves
 - C. Packings
 - D. Throttling service
 - E. None of the Above
89. 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. Stem
 - B. Valve
 - C. Packings
 - D. None of the Above

90. 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. Valves
- C. Packings
- D. Bonnet
- E. None of the Above

Globe Valve Problems and Solutions

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

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

92. 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. Upright
- E. None of the Above

93. 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

94. 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

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

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

96. 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. Upright
- E. None of the Above

97. 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. Upright
- E. None of the Above

98. 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. Upright
- E. None of the Above

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

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

100. 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. Handwheel
- E. None of the Above

101. 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. Handwheel
- E. None of the Above

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

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

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

Ball or Corporation Stop

104. 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 check
- C. Valve components
- D. Handwheel
- E. None of the Above

105. 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. Valve components
- D. Handwheel
- E. None of the Above

106. 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

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

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

108. 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

109. 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

110. 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

111. 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

112. 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

113. 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

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

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

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

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

117. 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. Prevent water hammer
- C. Can damage the valve disc
- D. None of the Above

118. 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 horizontal or inclined from vertical
- B. Prevent water hammer
- C. Can damage the valve disc
- D. Valve body is recommended
- E. None of the Above

119. 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. Can damage the valve disc
- D. Open or close the valve
- E. None of the Above

120. 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. 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

Butterfly Valve Problems

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

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

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

122. 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. Shaft must be replaced
- E. None of the Above

123. 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. Loosen the packing
- B. Adaptor is misaligned
- C. Assembly-disassembly procedure
- D. Shaft must be replaced
- E. None of the Above

124. 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. Adaptor is misaligned
- C. Tighten to the required level
- D. Remove valve from service
- E. None of the Above

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

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

126. 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

127. 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. Shaft must be replaced
- E. None of the Above

128. 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 the packing
- B. Adaptor is misaligned
- C. Improve valve shaft rotation
- D. Shaft must be replaced
- E. None of the Above

How do Pressure Relief Valves Operate?

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

- A. Allow water from the distribution system
- B. Main valve and pilot control
- C. Malfunctioning valves and to prevent valves
- D. Spring and the weight
- E. None of the Above

130. 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. Allow water from the distribution system
- D. Controller and a separate data logger
- E. None of the Above

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

- A. 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

132. 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. Allow water from the distribution system
- D. Controller and a separate data logger
- E. None of the Above

133. 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. Allow water from the distribution system
- B. Controller and a separate data logger
- C. Day and night
- D. Spring and the weight
- E. None of the Above

Valve Exercising

134. 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. 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

135. 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
- C. Allow water from the distribution system
- D. Controller and a separate data logger
- E. None of the Above

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

- A. 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

More on Water Distribution Valves

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

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

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

- A. Operator(s)
- B. Inspections
- C. Management of emergencies
- D. Valve(s)
- E. None of the Above

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

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

140. 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. Operator(s)
- B. Inspections
- C. An utility emergency operations plan
- D. Valve(s)
- E. None of the Above

141. Equally important is the knowledge that when these _____ need to be operated in order to isolate a section of the distribution system, they will operate and close effectively in order to prevent a large loss of the water recourse and excessive property damage.

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

142. Routine valve _____ should be conducted on the water system valves and the following tasks should be accomplished:

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

143. 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. An utility emergency operations plan
- D. Valve(s)
- E. None of the Above

144. An _____ is performed on each valve stem and nut to determine if any damage exists.

- A. Operator(s)
- B. Inspection
- C. An utility emergency operations plan
- D. Valve(s)
- E. None of the Above

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

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

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

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

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

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

148. 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. Operator(s)
- B. Inspections
- C. An utility emergency operations plan
- D. Valve(s)
- E. None of the Above

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

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

Distribution System Hydrant Maintenance/Flushing

150. _____ 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
- C. Water department
- D. Nozzle cap thread gaskets
- E. None of the Above

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

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

Fire hydrant maintenance includes the following specific procedures:

152. All _____ are inspected for leakage and repairs are made when necessary.
- A. Fire hydrant(s)
 - B. An emergency
 - C. Water department
 - D. Nozzle cap thread gaskets
 - E. None of the Above
153. The _____ is fully opened and the ease of operation is noted.
- A. Fire hydrant(s)
 - B. An emergency
 - C. Water department
 - D. Nozzle cap thread gaskets
 - E. None of the Above
154. 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. An emergency
 - C. Water department
 - D. Nozzle cap thread gaskets
 - E. None of the Above
155. All fire hydrant _____ are inspected for thread damage and lubricated to provide ease of operation.
- A. Fire hydrant(s)
 - B. An emergency
 - C. Water department
 - D. Nozzle cap
 - E. None of the Above
156. All fire hydrant _____ are inspected and replaced as necessary.
- A. Fire hydrant(s)
 - B. An emergency
 - C. Water department
 - D. Nozzle cap thread gaskets
 - E. None of the Above
157. If a _____ 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. An emergency
 - C. Water department
 - D. Nozzle cap thread gaskets
 - E. None of the Above
158. Accurate records related to the maintenance procedures performed on the fire hydrants are maintained by the _____.
- A. Fire hydrant(s)
 - B. An emergency
 - C. Water department
 - D. Nozzle cap thread gaskets
 - E. None of the Above

Water Meters

159. 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
- B. Service meters
- C. Master meter
- D. Head loss
- E. None of the Above

160. 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
- B. Service meters
- C. Master meters
- D. Head loss
- E. None of the Above

161. 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 utilities
- B. Service meters
- C. Master meters
- D. Metered system
- E. None of the Above

162. _____ 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

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

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

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

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

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

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

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

Tree System

167. 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. Fire fighting
- C. Regular intervals
- D. Friction loss
- E. None of the Above

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

- A. Tree
- B. Fire fighting
- C. Regular intervals
- D. Friction loss
- E. None of the Above

169. 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. Fire fighting
- C. Regular intervals
- D. None of the Above

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

- A. Treelike
- B. Fire fighting
- C. Regular intervals
- D. Dead ends
- E. None of the Above

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

- A. Treelike
- B. Fire fighting
- C. Regular intervals
- D. Friction loss
- E. None of the Above

172. 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. Treelike
- B. Fire fighting
- C. Regular intervals
- D. None of the Above

Friction Loss

173. 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. Treelike
- B. Carry water
- C. Regular intervals
- D. Friction loss
- E. None of the Above

174. 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. Treelike
- B. Carry water
- C. Regular intervals
- 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)

175. 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 installation
- B. Resistance
- C. C Factor
- D. Temperatures
- E. None of the Above

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

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

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

- A. Easy installation
- B. Resistance
- C. Non-metallic
- D. Temperatures
- E. None of the Above

178. 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. Easy installation
- B. Resistance
- C. C Factor
- D. Temperatures
- E. None of the Above

179. The higher the _____ the smoother the pipe.

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

180. 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. Temperatures
- E. None of the Above

181. 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. Easy installation
- B. Resistance
- C. C Factor
- D. Temperatures
- E. None of the Above

182. 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 installation
- B. Resistance
- C. Versatile
- D. Temperatures
- E. None of the Above

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

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

184. 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. Easy installation
- B. Resistance
- C. C Factor
- D. Temperature
- E. None of the Above

185. 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. Easy installation
- B. Resistance
- C. C Factor
- D. Temperatures
- E. None of the Above

186. _____ 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)

187. 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
- D. Corrosion problems
- E. None of the Above

188. 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
- D. Corrosion problems
- E. None of the Above

189. _____ 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
- D. Corrosion problems
- E. None of the Above

Ductile Iron Pipe (DIP)

190. 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
- D. Corrosion problems
- E. None of the Above

191. 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
- D. Corrosion problems
- E. None of the Above

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

Steel Pipe

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

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

194. 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

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

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

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

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

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

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

Asbestos Cement Pipe (ACP)

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

- A. Advantage(s)
- B. Disadvantage(s)
- C. Installation
- D. Available in diameters
- E. None of the Above

199. 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
- D. Corrosion problems
- E. None of the Above

200. 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
- D. Corrosion problems
- E. None of the Above

201. 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

202. 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

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

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

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

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

- A. Nominal inside diameters
- B. Commonly used
- C. Resist corrosion
- 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.

206. 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

207. 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

208. 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

209. 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. Drainage piping
- E. None of the Above

210. _____ 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

211. _____ 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

212. 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

213. _____ 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

214. 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

215. 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

Joints and Fittings

216. _____ 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

217. 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
- D. Reducer
- E. None of the Above

Tapping Sleeve

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

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

219. 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. Reducer
- E. None of the Above

220. 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. Reducer
- E. None of the Above

Caps

221. A pipe cap 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. Reducer
- E. None of the Above

Couplings

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

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

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

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

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

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

Elbows (Or Ells) 90° AND 45°

226. 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

227. _____ have female threads at both outlets.

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

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

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

Nipples

230. 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. Galvanization
- C. Street elbows
- D. Male thread
- E. None of the Above

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

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

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

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

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

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

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

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

Tees

235. 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

236. 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

237. 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

238. 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

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

- A. Distribution lines
- B. Without assistance
- C. Water provider
- D. Emergency repair
- E. None of the Above

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

- A. Distribution lines
- B. Without assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

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

- A. Distribution lines
- B. Without assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

Spare Parts Inventory

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

- A. Distribution lines
- B. Without assistance
- C. Complete inventory
- D. Emergency repair
- E. None of the Above

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

- A. Water lines
- B. Without assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

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

- A. Distribution lines
- B. Without assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

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

- A. Distribution lines
- B. Without assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

246. 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. Without assistance
- C. Disinfection
- D. Emergency repair
- E. None of the Above

Preventative Maintenance (PM)

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

- A. Corrosion
- B. Undermine
- C. Deteriorate
- D. Accordance
- E. None of the Above

248. 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. Undermine
- C. Deteriorate
- D. Accordance
- E. None of the Above

249. 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. Corrosion
- B. Undermine
- C. Effectively
- D. Accordance
- E. None of the Above

250. 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. Undermine
- C. Deteriorate
- D. Accordance
- E. None of the Above

251. 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. Corrosion
- B. Discovered
- C. Deteriorate
- D. Accordance
- E. None of the Above

Water Main Installation

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

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

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

- A. Buried
- B. Ground surface
- C. Bedded and backfilled
- D. Good construction practices
- E. None of the Above

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

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

255. 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
- C. Bedded and backfilled
- D. Good construction practices
- E. None of the Above

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

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

257. _____ 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. Bedded and backfilled
- D. Good construction practices
- E. None of the Above

258. Valves and fittings used in the waterworks industry 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

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

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

260. 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

261. 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

262. 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

263. _____ 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

264. 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

265. 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

266. 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. Constant evaluation of the system
- C. Minimum cleansing velocity
- D. Determine if pipe capacity
- E. None of the Above

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

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

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

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

269. _____ 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. Determine if pipe capacity
- E. None of the Above

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

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

271. 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

272. 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

273. An example is the piping between a public water system or consumer's potable water system and an _____, cooling system, or irrigation system.

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

274. _____: 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

275. _____: 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

276. _____: 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

277. _____: 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

278. _____: 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

279. 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

280. 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

281. 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
- D. Downstream pressure
- E. None of the Above

Backpressure

282. 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. Backpressure
- C. Nonpotable
- D. Downstream pressure
- E. None of the Above

283. 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. Nonpotable
- D. Downstream pressure
- E. None of the Above

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

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

285. 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

286. 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

287. 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

288. 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. See Cross-connection control.

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

289. 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

290. 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

291. 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

292. 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

293. 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

294. 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

295. 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

296. 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

Approved Air Gap Separation (AG)

297. An approved air gap is a _____ 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. An obstruction
- E. None of the Above

298. 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. Air flow is restricted
- C. Least twice the inside diameter of the inlet pipe
- D. An obstruction
- E. None of the Above

299. An obstruction around or near an _____ may restrict the flow of air into the outlet pipe and nullify the effectiveness of the air gap to prevent backsiphonage.

- A. Air gap
- B. Air flow is restricted
- C. Least twice the inside diameter of the inlet pipe
- D. An obstruction
- E. None of the Above

300. When the air flow is restricted, such as the case of an air gap located near a wall, the _____ separation must be increased.

- A. Air gap
- B. Air flow is restricted
- C. Least twice the inside diameter of the inlet pipe
- D. An obstruction
- E. None of the Above

You are finished with your assignment, please fax or e-mail the answer key and registration form to TLC. Always call us to confirm that we've received the paperwork.