(b) Installation.
(1) condition of flange mating surfaces;
(2) joint alignment and gasket placement before boltup;
(3) implementation of specified bolting procedures.

F322 DESIGN CONSIDERATION FOR SPECIFIC SYSTEMS.

F322.6 Pressure Relief Piping.

(a) Stop Valves in Pressure Relief Piping.

F323 MATERIALS.

(a) Selection of materials to resist deterioration.
(b) Information on material performance in corrosive environments--see NACE.

F323.1 General Considerations.

(a) Exposure to fire and melting point of materials.
(b) Brittle fracture or failure.
(c) Ability of thermal insulation to protect piping when exposed to a fire.
(d) Crevice corrosion.
(e) Electrolytic effects.
(f) Compatibility of lubricants or sealants used on threads.
(g) Compatibility of packing, seals, and O-rings.
(h) Compatibility of materials such as: cements, solvent, solders, & brazing materials with the fluid service.
(i) Chilling effect of sudden loss of pressure.
(j) Possibility of pipe support failure from exposure to low or high temperatures.
(k) Compatibility of materials, including sealants, gaskets, lubricants, and insulation, used in strong oxidizer fluid service (e.g., oxygen or fluorine)..

F322.4 Specific Material Considerations--Metals.

(a) Irons--cast, Malleable, High Silicon.
(b) Carbon Steel, and Low and Intermediate Alloy Steels.
(1) possibility of embrittlement with alkaline or caustic.
(2) possibility of conversion of carbides to graphite when exposed long term to temperatures above 800 degrees F.--carbon steels, plain nickel steel, carbon-manganese steel, and carbon-silicon steel.
(3) possibility of conversion of carbides to graphite when exposed to temperatures above 875 degrees F--carbon-molybdenum steel, manganese-molybdenum-vanadium steel, and chromium-vanadium steel.
(4) advantages of silicon-killed carbon steel for temperatures above 900 degrees F.
(5) possibility of damage due to hydrogen exposure at elevated temperature (API RP 941).
(6) possibility of stress corrosion cracking when exposed to cyanides, acids, acid salts, or wet hydrogen sulfide--maximum hardness limit is usually specified (NACE MR 0175 and RP 0472).
(7) possibility of sulfidation in the presence of hydrogen sulfide at elevated temperatures.
(c) High Alloy (Stainless) Steels.
(1) possibility of stress corrosion cracking.
(2) susceptibility to intergranular corrosion.
(3) susceptibility to intercrystalline attack on contact with liquid metals.
(4) brittleness of ferritic stainless steels at room temperature after service at temperatures above 700 degrees F (885 embrittlement).
(d) Nickel and Nickel Base Alloys.
(1) susceptibility to grain boundary attack by sulfur at temperatures above 600 degrees F.

(2) susceptibility to grain boundary attack at temperatures above 1100 degrees F under reducing conditions and above 1400 degrees F under oxidizing conditions.
(3) possibility of stress corrosion cracking of nickel-copper Alloy 400 in HF vapor in the presence of air, also, if the alloy is highly stressed.

(e) Aluminum and Aluminum Alloys.
(1) compatibility with aluminum of thread compounds used in aluminum threaded joints.
(2) possibility of corrosion from concrete, mortar, lime, plaster, or other alkaline materials.
(3) susceptibility of alloys to intergranular attack or exfoliation (scaling).

(f) Copper and Copper Alloys.
(1) possibility of dezincification.
(2) susceptibility to stress-corrosion cracking when exposed to ammonia.
(3) possibility of unstable acetylide formation when exposed to acetylene.

(g) Titanium and Titanium Alloys.
(1) possibility of deterioration above 600 degrees F.

(h) Zirconium and Zirconium Alloys.
(1) possibility of deterioration above 600 degrees F.

(i) Tantalum.
(1) possibility of reactivity with all gases except the inert gases above 570 degrees F.

(j) Metals With Enhance Properties.
(1) possible loss of strength, in a material whose properties have been enhanced by heat treatment, during long-continued exposure to temperatures above its tempering temperature.

(k) Desirability of specifying some degree of production impact testing, in addition to the weld procedure qualification tests, when using materials with limited low temperature service experience below the minimum temperature stated in Table A-1 of B31.3.

F335 ASSEMBLY AND ERECTION.

F335.9 Cleaning of Piping.

(a) requirements of the service, including possible contaminants and corrosion products during fabrication, assembly, storage, erection, and testing.
(b) for low temperature service, removal of moisture, oil, grease, and other contaminants to prevent sticking of valves or blockage of piping and small cavities.
(c) for strong oxidizer fluid service (e.g., oxygen or fluorine), special cleaning and inspection.

FA323.4 Material Considerations--Nonmetals.

(a) Static Charges.
(b) Thermoplastics.
(c) Borosilicate Glass.

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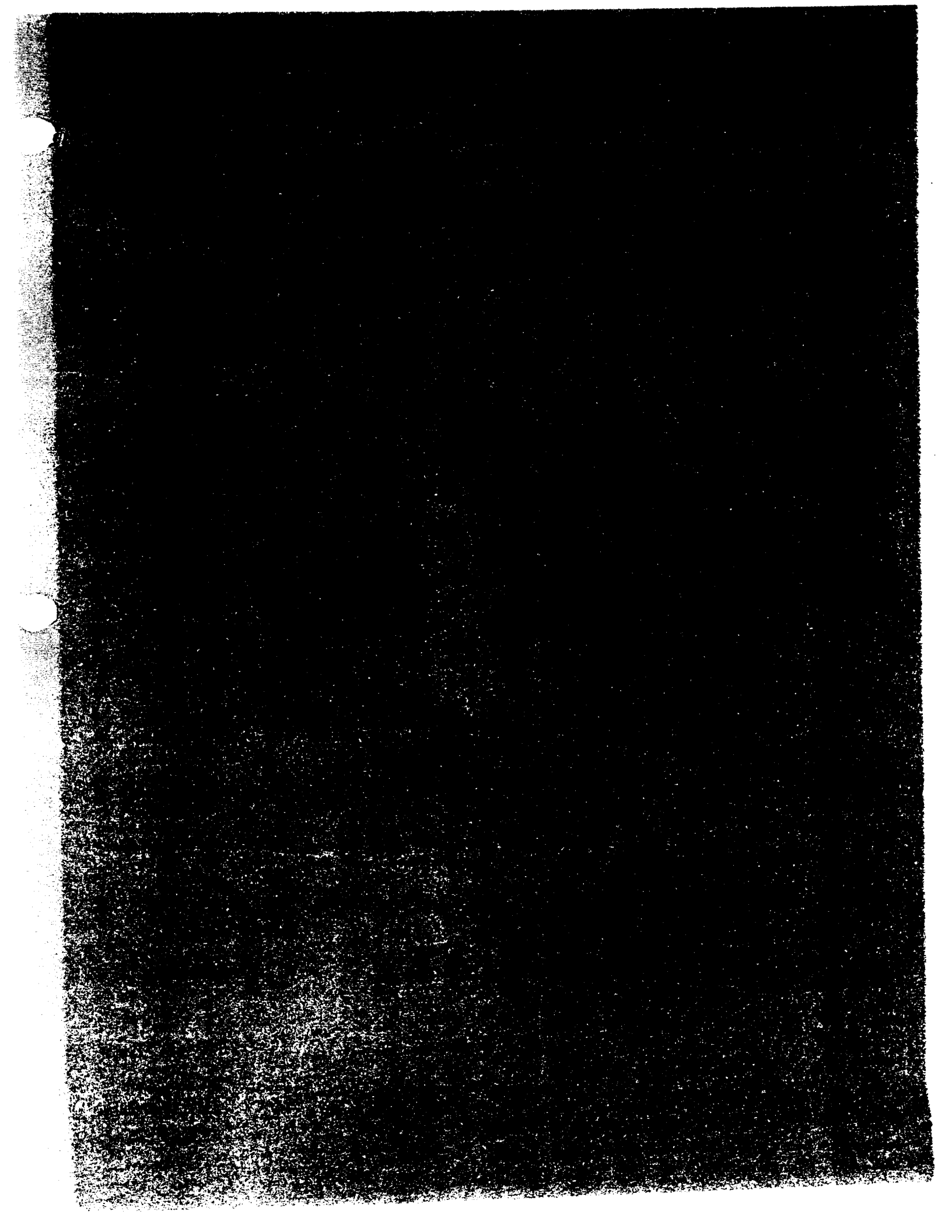

ASME B31.3 - PRACTICE QUESTIONS
CLOSED BOOK

1. The requirements of the latest edition of ASME Code Section B31.3 and any subsequent Addenda:

   a. must be followed explicitly as soon as the latest edition is issued.
   b. are retroactive and all piping installed per earlier additions must be upgraded.
   c. are not retroactive & all piping installed per earlier additions need not be upgraded.
   d. may be used without regard to the acceptability of Code revisions to the jurisdiction.

2. Clauses in the B31 code are not necessarily numbered consecutively. Such discontinuities result from:

   a. the age of the code and the number of changes that have been made.
   b. following a common outline, insofar as practical for all Code Sections.
   c. no particular logic was followed in the original versions of the Code.
   d. practices followed by all Codes to make them difficult to reproduce.

3. Who has the responsibility of determining which Code Section is applicable to piping installations, i.e., B31.1, B31.3, etc.?

   a. owner
   b. inspector
   c. jurisdiction
   d. engineer

4. Who has the overall responsibility for compliance with ASME B31.3?

   a. inspector
   b. owner
   c. engineer
   d. jurisdiction

5. The intent of ASME B31.3 is to set forth engineering requirements deemed necessary for _____ _____ and _____ of piping installations.

   a. structural design, fabrication
   b. safe design, construction
   c. adequate fabrication, execution
   d. permanent existence, longevity

6. ASME Code is not intended to apply to piping:

   a. in the chemical industry.
   b. that has been placed in service.
   c. in the agronomy industry.
   d. in the space industry.

7. Compatibility of materials with the service and hazards from instability of contained fluids:

   a. is covered extensively by ASME B31.3.
   b. are not within the scope of ASME B31.3.
   c. is addressed on a limited basis by ASME B31.3.
   d. is the main scope of ASME B31.3.

8. ASME B31.3 applies to piping for all fluids except for which of the below?

a. tubes of fired heaters, plumbing, and storm sewers
b. raw, intermediate, and finished chemicals
c. petroleum products, fluidized solids and refrigerants
d. gas, steam, air, and water

9. A preplaced filler metal which is completely fused into the root of a welded joint and becomes part of the weld is called:

a. a depleted appendage.
b. a preplaced ligament.
c. a consumable insert.
d. a caulked joint.

10. Define "face of weld".

a. It is the longitudinal view of a weld that has been split down the middle for inspection.
b. It is the elevation view of a weld that has been cut out to show its cross section.
c. It is the concealed weld surface on the side opposite from which the welding was done.
d. It is the exposed surface of a weld on the side from which the welding was done.

11. A fluid service that is nonflammable, nontoxic, and not damaging to human tissue and its gage pressure does not exceed 150 psi and the design temperature is from -20 degrees through 366 degrees F is known as a category _____ fluid.

a. D
b. C
c. M
d. N

12. A fluid service in which the potential for personnel exposure is judged to be significant and in which a single exposure to a very small quantity of a toxic fluid, caused by leakage, can produce serious irreversible harm to persons on breathing or bodily contact, even when prompt restorative measures are taken is known as a category _____ fluid.

a. D
b. M
c. H
d. N

13. A fillet weld whose size is equal to the thickness of the thinner member joined is called:

a. a butt fillet weld.
b. a longitudinal fillet weld.
c. a full fillet weld.
d. a fillet weld with out backing.

14. The heating of metal to and holding at a suitable temperature and then cooling at a suitable rate for such purposes as: reducing hardness, improving machinability, facilitating cold working, producing a desired microstructure, or obtaining desired mechanical, physical, or other properties is known as:

a. annealing.
b. normalizing.
c. quenching.
d. stress-relieving.

15. A piping joint that for the purpose of mechanical strength or leak resistance, or both, in which the mechanical strength is developed by threaded, grooved, rolled, flared, or flanged pipe ends; or by bolts, pins, toggles, or rings; and the leak resistance is developed by threads and compounds, gaskets, rolled ends, caulking, or machined and mated surfaces is known as a:

a. bonded joint.
b. mechanical joint.
c. fused joint.
d. juke joint.

16. The term NPS 6 refers to:

a. a pipe whose outside diameter is 6.625".
b. a pipe whose outside diameter is 6".
c. a pipe whose radius is 6"
d. a tube whose inside diameter is 6"

17. A pipe produced by piercing a billet followed by rolling or drawing, or both is a:

a. electric-fusion welded pipe.
b. spiral welded pipe.
c. seamless pipe.
d. ERW pipe.

18. What is a "root opening"?

a. It is the gaps between flanges left to facilitate the installation of gaskets.
b. It is the division between different rods accounting for different metallurgy.
c. It is the separation between members to be joined by welding, at the root of the joint.
d. It is the conjunction of members joined by bonding at the face of the joint.

19. A weld intended primarily to provide joint tightness against leakage in metallic piping is known as a:

a. fillet weld.
b. fissure weld.
c. seal weld.
d. caulking weld.

20. A weld made to hold parts of weldment in proper alignment until the final welds are made is known as a:

a. face weld.
b. fissure weld.
c. seal weld
d. tack weld.

21. The junction between the face of a weld and the base metal is known as:

a. root of the weld.
b. face of the weld.
c. toe of the weld.
d. throat of the weld.

22. The pressure in a piping system that is the pressure at the most severe condition of coincident internal or external pressure and temperature (minimum or maximum) expected during service (except for allowances for occasional variations of pressure or temperature, or both, above operating levels which are characteristics of certain services) is known as:

a. excursion pressure.
b. test pressure.
c. design pressure.
d. absolute pressure.

23. Piping not protected by a pressure relieving device, or that can be isolated from a pressure relieving device, shall be designed for at least the:

a. usual pressure that is developed.
b. median pressure that is developed.
c. average pressure that can be developed.
d. highest pressure that can be developed.

24. What might happen to a piping system that has a gas or vapor in it (like steam) and it is allowed to cool significantly?

a. Nothing will happen.
b. The gas or vapor will form a liquid which will not affect the piping system.
c. The pressure in the piping system may reduce sufficiently to create a internal vacuum.
d. The pressure in the piping system may increase and create an over pressure.

25. What happens to a piping system that has fluids in it and the fluids are heated with the system blocked?

a. The internal pressure will decrease.
b. The internal pressure will increase.
c. There will be no change in the system.
d. The external pressure will increase.

26. _____ _____ caused by external or internal conditions (including changes in flow rate, hydraulic shock, liquid or solid slugging, flashing, and geysering) shall be taken into account in the design of piping.

a. Virtual kinetics
b. Abnormal potential
c. Normal dynamism
d. Impact forces

27. Loads on a piping system that include the weight of the medium transported or the medium used for test and snow loads or ice loads are examples of _____ loads.

a. dead
b. live
c. normal
d. vortex

28. What can be caused by low operating temperatures, including the chilling effect of sudden loss of pressure on highly volatile fluids, or in alloy piping the failure to properly post weld heat treat after welding?

a. Thermal restraint effect.
b. Loss of ductility or reduced ductility.
c. Increase in plasticity or deformation.
d. Increase in toughness strength.

29. Fillet welds may vary from convex to concave. The size of a fillet weld is based on the theoretical throat, which is _____ x the leg length.

a. .707
b. .770
c. 1.414
d. .500

30. In spot radiography of circumferential butt welds, it is recommended that not less than one shot for each _____ welds for each welder/operator be completed.

a. 5
b. 10
c. 20
d. 30

31. If a requirement is specified in the engineer design, but is not a Code requirement, ASME B31.3 states that the requirement _____.

a. may be ignored.
b. may be optionally applied
c. shall be implemented only if the Inspector requires it.
d. shall be considered a Code requirement.

32. In the equation, $t_m=t+c$, pick the correct definition of the value "t".

a. minimum required thickness, including mechanical, corrosion, & erosion allowances.
b. pressure design thickness, as calculated for internal pressure.
c. pipe wall thickness (measured or minimum per purchase specification.
d. minimum design temperature of the pipe.

33. When the service is erosive, if there is crevice corrosion present, or if cyclic loadings occur, slip-on flanges shall:

a. be bolted together with double nutted machine bolts.
b. be bolted together with machine bolts.
c. not be used.
d. be double welded.

34. The use of slip-on flanges should be _____ where many large temperature cycles are expected particularly if the flanges are not insulated.

a. called for
b. encouraged
c. avoided
d. the first choice

35. Severe cyclic service conditions require the use of:

a. slip-on flanges.
b. welding neck flanges.
c. socket weld flanges.
d. lap joint flanges.

36. Bolting having not more than _____ ksi specified minimum yield strength shall not be used for flanged joints rated ASME B16.5 Class 400 and higher.

a. 35
b. 30
c. 45
d. 40

37. Tapped holes for pressure retaining bolting in metallic piping components shall be of sufficient depth that the thread engagement will be al least _____ times the nominal thread diameter.

a. 7/8
b. 3/4
c. 5/8
d. 1/2

38. What type backing rings shall not be used under severe cyclic conditions?

a. continuous backing rings.
b. split backing rings
c. slip-on backing rings
d. consumable backing rings

39. Socket welded joints should be avoided in any service where _____ or _____ occur.

a. crevice corrosion, severe erosion
b. graphitic corrosion, continual fretting
c. plug type dezincification, severe carburization.
d. hydrogen attack, sensitization

40. Socket welds larger than NPS _____ shall not be used under severe cyclic conditions.

a. 3/4
b. 1
c. 1.5
d. 2

41. Which of the listed items is NOT a location where fillet welds are permissible?

a. weld of socket weld flange.
b. attach a weld neck flange.
c. weld of a slip-on flange.
d. attach a nozzle reinforcement pad.

42. What type weld is considered to furnish no strength and is only used to prevent leakage of threaded joints?

a. tack weld
b. seal weld
c. fillet weld
d. butt weld

43. Where flanges of different ratings are bolted together,:

a. the rating of the joint shall not exceed that of the higher rated flange.
b. they are not acceptable and one flange shall be changed where they both match.
c. the rating of the joint shall not exceed that of the lower rated flange.
d. the bolt diameter must be 1/8" less than that required for the lower rated flange.

44. Where a metallic flange is bolted to a nonmetallic flange,:

a. a ring joint type gasket is preferred.
b. a spiral wound grafoil filled gasket is preferred.
c. a full-faced gasket is preferred.
d. a Grayloc type gasket is preferred.

45. What type of joint should not be used under severe cyclic conditions?

a. welded joints
b. expanded joints
c. flanged joints
d. lap joints

46. Threaded joints should be avoided in any service where:

a. crevice corrosion, severe erosion, or cyclic loadings may occur.
b. graphitic corrosion, biological corrosion or static loadings may occur.
c. graphitization, sensitization, or longitudinal loadings may occur.
d. dezincification, hydrolysis, or hoop stress loadings may occur.

47. An inspector is checking threaded joints prior to seal welding them. What is an important item to check?

a. Check and make sure all gasket surfaces are covered.
b. Make sure that thread sealing compound has not been used.
c. Check the longitudinal loading of the joint.
d. Make sure that the consumable insert to be used is made from the correct material

48. The intentional deformation of piping during assembly to produce a desired initial displacement and stress is known as:

a. hot spring.
b. cold spring.
c. post stress.
d. displacement

49. When fitting up a socket weld joint, the male end is welded in the female socket with:

a. an approximate 1/32" gap at the base of the joint.
b. no gap left at the base of the joint.
c. an approximate 1/16" gap at the base of the joint.
d. an approximate 1/8" gap at the base of the joint.

50. A weld defect to be repaired shall be removed:

a. to the satisfaction of the pipe fitter.
b. to apparently good material.
c. until the defect can no longer be seen.
d. to sound metal.

51. What is acceptable as an alternate heat treatment for B31.3 piping?

a. Synthesizing, forging, or standardizing
b. Pre-heating, peening, or case hardening
c. Stress relieving, tempering, or peening
d. Normalizing, normalizing and tempering, or annealing

52. When an entire piping assembly to be heat treated cannot be fitted into the furnace, it is permissible to heat treat in more than one heat, provided there is at least _____ overlap between successive heats, and that parts of the assembly outside the furnace are protected from harmful temperature gradients.

a. 6 inches
b. 1 foot
c. 2 feet
d. 3 feet

53. According to B31.3, Inspection applies to functions performed:

a. by a third party Inspector or their delegates.
b. by the owner's Inspector or the Inspector's delegates.
c. by a jurisdictional Inspector or their delegates.
d. by an ASME Inspector or their delegates.

54. Who is responsible for verifying that all required examinations and testing have been completed and to inspect the piping to the extent necessary to be satisfied that it conforms to all applicable examination requirements of the ASME B31.3 Code and of the engineering design?

a. It is the owner's responsibility, exercised through his Inspector.
b. It is the API Examiner's responsibility.
c. It is the Jurisdiction's Inspector's responsibility.
d. It is the ASME's Inspector's responsibility.

55. According to ASME B31.3, how much experience in the design, fabrication, or inspection of industrial pressure piping must an Piping Inspector have?

a. 10 years
b. 8 years
c. 6 years
d. 5 years

56. Prior to initial operation each piping installation, including components and workmanship shall be examined in accordance with ASME B31.3, paragraph 341. When should examination of P-Numbers 3, 4, and 5 materials be carried out?

a. Examination shall be performed prior to any heat treatment.
b. Examination shall be performed before heat treatment and after heat treatment.
c. Examination shall be performed after completion of any heat treatment.
d. Examination shall be performed on at least 5% of the fabrication after heat treatment.

57. For normal fluid service, how much of the piping welds (circumferential and miter groove welds) shall be examined by random radiography?

a. 3%
b. 10%
c. 5%
d. 33%

58. VT, MT, PT, UT and RT shall be performed as specified in the:

a. ASME BPV Code, Section V
b. ASME BPV Code, Section IX
c. ASME BPV Code, Section VIII
d. ASME BPV Code, Section I

59. The extent of radiography when considering longitudinal welds, the minimum requirement is _____ inches of weld length.

a. 12
b. 9
c. 6
d. 4

60. Which of the following examinations is NOT considered an in-process examination?

a. examination of joint preparation and cleanliness.
b. examination of fit-up, joint clearance, and internal alignment prior to joining.
c. examination of appearance of the finished joint.
d. examination of material for toughness.

61. What method of in-process examination is used unless additional methods are specified in the engineering design?

a. MT
b. RT
c. UT
d. VT

62. What is the only category fluid service that may be subject to an initial in-service leak test?

a. Category M
b. Category D
c. Category N
d. Category H

OPEN BOOK QUESTIONS

63. What is the minimum wall schedule that can be used in a male threaded joint in normal fluid service, carbon steel (notch-sensitive) and NPS 1.5 and smaller?

a. Sch 10
b. Sch 40
c. Sch 80
d. Sch 160

64. What is an example of a straight-threaded joint?

a. threads (male) of threaded piping
b. threads (female) on a threaded valve
c. an union comprising male and female ends joined with a threaded union nut
d. a joint used in instrument tubing.

65. Determine the linear expansion (in/100ft) of a carbon steel pipe between 70 degrees F. and 450 degrees F.

a. 3.04" per 100 ft.
b. 3.39" per 100 ft.
c. 2.93" per 100 ft.
d. 3.16" per 100 ft.

66. A 20' long carbon steel pipe is heated uniformly to 450 degrees F. from 70 degrees F. Determine its length after heating.

a. 20.052'
b. 20.263'
c. 20.210'
d. 20.250'

67. If 4 materials, carbon steel, 18Chr-8Ni, Monel, Aluminum are heated from 70 degrees F. to 550 degrees F., which one will expand more?

a. 18Chr-8Ni
b. Monel
c. Aluminum
d. Carbon steel

68. What is the modulus of elasticity of carbon steel material (carbon content $\leq$ 0.3) at 700 degrees F.

a. 25,500,000 psi
b. 25,300,000 psi
c. 26,700,000 psi
d. 29,500,000 psi

69. Poisson's ratio may be taken as ____ at all temperatures for all metals.

a. 0.30
b. 0.31
c. 0.32
d. 0.33

70. Stop valves are allowed on the inlet and outlet side of a pressure relieving device, provided:

a. the valves are approved by the jurisdiction.
b. they are approved by the inspector.
c. they can be locked or sealed in both the open and closed position.
d. the valves are non-rising stem valves.

71. For a liquid thermal expansion relief device which protects only a blocked-in portion of a piping system, the set pressure shall not exceed the lesser of the system test pressure or _____ % of design pressure.

a. 105
b. 110
c. 115
d. 120

72. An ASTM A53 Grade B pipe with a maximum wall thickness of 0.75" is being considered for use in a cold service. What minimum temperature can it be used and not have an impact test?

a.+20 degrees F.
b.+15 degrees F.
c.+10 degrees F.
d. 0 degrees F.

73. Each set of impact test specimens shall consist of _____ specimen bars.

a. 2
b. 3
c. 4
d. 5

74. A carbon steel ASTM A53 Grade B material is being impact tested. What is the minimum energy requirement for this material (average for 3 specimens--fully deoxidized steel)?

a. 7 ft-lbs
b. 10 ft-lbs
c. 13 ft-lbs
d. 15 ft-lbs

75. A thicker wall pipe is joined to a thinner wall pipe. The thicker pipe is taper bored to facilitate the fit up. What is the maximum slope of the taper bore?

a. 15 degrees
b. 20 degrees
c. 25 degrees
d. 30 degrees

76. A NPS 2 Schedule 80 (0.218" wall) is welded into a NPS 6 Schedule 40 (0.0.280" wall) header. What size cover fillet weld (t_c) is required around the fully penetrated groove weld of the branch into the header? (Express answer to nearest hundredth.)

a. 0.15"
b. 0.20"
c. 0.22"
d. 0.25"

77. A NPS 8 Schedule 40 (0.322" wall), ASTM A106 Grade B, is to be welded. The weather is clear. The sun is shining. The temperature is 30 degrees F. What preheat temperature, if any, is required.

a. None
b. 25^0 F
c. 50^0 F
d. 175^0 F

78. The zone for preheat shall extend:

a. at least 1/2" beyond each edge of the weld.
b. at least 1" beyond each edge of the weld.
c. over only the weld itself.
d. at a minimum 2" each side of the weld.

79. An ASME A106 Grade B, NPS 8, Schedule 40 (0.322" wall) pipe is to be welded to an ASME A335 Grade P9, NPS 8, Schedule 40 (0.322" wall) pipe. What preheat temperature is required?

a. 50^0 F
b. 175^0 F
c. 300^0 F
d. 350^0F

80. When components of a piping system are joined by welding, the thickness to be used in applying the heat treatment provisions of ASME B31.3, Table 331.1.1 shall be:

a. that of the thinner component measured at the joint, except for certain exclusions.
b. that of the thicker component measured at the joint, except for certain exclusions.
c. that of the average thickness of the two components, except for certain exclusions.
d. that of the thinner component measured in the thinner pipe except exclusions.

81. A NPS 4 Schedule 40 (0.237" wall) branch connection is welded into a NPS 6 Schedule 40 (0.0.280" wall) header. A 1/4" reinforcing pad is used around the branch connection. The branch connection is inserted into the header. The material of the branch and the header is ASTM A106 Grade B. What thickness would be used to determine whether heat treatment of this connection is required. (Express answer to nearest hundredth.)

a. 0.80"
b. 0.77"
c. 0.70"
d. 0.60"

82. An ASME A335 Grade P9, NPS 8, Schedule 40 (0.322" wall) pipe is to be welded to an ASME A335 Grade P9, NPS 8, Schedule 40 (0.322" wall) pipe. What Brinnell Hardness is required after post weld heat treatment?

a. 200
b. 225
c. 241
d. 250

83. Where a hardness limit is specified in Table 331.1.1, at least _____ % of welds, hot bends, and hot formed components in each furnace heat treated batch and 100% of those locally heat treated shall be tested.

a. 5
b. 10
c. 15
d. 20

84. An ASME A335 Grade P11, NPS 8, Schedule 120 (0.718" wall) pipe is to be welded to an ASME A335 Grade P9, NPS 8, Schedule 80 (0.500" wall) pipe. What Brinnell Hardness number is required after post weld heat treatment?

a. The Grade P11 material is the controls; thus, the Bhn number must be $\leq$ 225.
b. The average of both materials must give a Bhn number of $\leq$ 233.
c. The Grade P9 material only requires checking; its Bhn number must be $\leq$ 241.
d. The Grade P11 material must be $\leq$ 225 and the Grade P9 material must be $\leq$ 241.

85. Flattening of a bend, the difference between maximum and minimum diameters at any cross section, shall not exceed _____ % on nominal outside diameter for internal pressure.

a. 5
b. 8
c. 10
d. 12

86. Flattening of a bend, the difference between maximum and minimum diameters at any cross section, shall not exceed _____ % on nominal outside diameter for external pressure.

a. 2
b. 3
c. 5
d. 8

87. While assembling a piping system it is required to pull two pieces into alignment. This distorts one of the pieces (puts a bend into one of the pipe sections. The assembly is in a strain that the inspector feels is detrimental to the equipment. What action should the Inspector take?

a. Since any distortion that introduces a strain is prohibited, the detail(s) should be removed and the problem corrected.
b. Since the pipe details fit up and there appears to be no problem, the system may be tested and if no leaks the Inspector can accept it.
c. As long as the system will fit together and the flanges and other connections will make connection, the Inspector may accept it.
d. If the system will not make connection the Inspector should require the problem to be corrected; however, if it connects without leaks, the Inspector may accept it.

88. Before bolting up flanged joints, the Inspector should check alignment to the design plane. It should be within _____ in/ft or _____ % measured across any diameter.

a. 1/16, 0.5%
b. 1/8, 0.05%
c. 1/32, 0.05%
d. 1/64, 0.5%

89. Before bolting up flanged joints, the Inspector should check alignment of the flange bolt holes. They shall be aligned within ____ inch maximum offset.

a. 1/32
b. 1/16
c. 1/8
d. 9/64

90. An Inspector, checking bolts on flanges, finds 3 bolts in a NPS 6, 300# class flange that will not meet ASME B31.3 bolt length specification. What did he find?

a. The bolt only extended from the nut by 1/4"
b. The lack of engagement was 2 threads.
c. The lack of engagement was 1 thread.
d. The bolt only extended from the nut by 3/8"

91. You find a flanged joint with two fiber gaskets used to make up the joint. What is the correct course of action for an Inspector?

a. Remove the gaskets and replace them with two spiral wound grafoil filled gaskets.
b. The joint is acceptable as is because the gaskets are fiber.
c. Two gaskets are unacceptable, have the joint repaired to take only one gasket.
d. Remove the gaskets and replace them with two wrapped with grafoil tape.

92. An Inspector finds incomplete penetration in a radiograph of a girth weld of normal fluid service piping. What can he accept or can he accept any incomplete penetration?

a. If the incomplete penetration is 1/16" or less (or $\leq 0.2\overline{T}_w$) deep, he may accept.
b. If the incomplete penetration is 1/32" or less (and $\leq 0.2\overline{T}_w$) deep, he may accept.
c. He may not accept the incomplete penetration.
d. If the incomplete penetration is 1/32" or less (or $\leq \overline{T}_w$) deep, he may accept.

93. When spot or random examination reveals a defect, what should the Inspector do?

a. Take one additional sample of the same kind used for the first examination. If it is acceptable, repair or replace the original defect and accept the job.
b. Take two additional samples of the same kind used for the first examination. If they are acceptable, repair or replace the original defect and accept the job.
c. Take two additional samples using a different inspection technique. If this is acceptable, repair or replace the original defect and accept the job.
d. Take 4 additional samples of the same kind used for the first examination. If they are acceptable, repair or replace the original defect and accept the job.

94. Prior to a hydrostatic test, a piping system may be subject to a preliminary test using air at no more than _____ psi gage to locate major leaks.

a. 45
b. 35
c. 25
d. 15

95. What is the minimum time that a leak test must be maintained (all joints and connections shall be examined for leaks).?

a. 60 minutes
b. 45 minutes
c. 30 minutes
d. 10 minutes

96. A NPS 10 ASTM A335 Grade P9 pipe was installed. It had to be changed by adding an NPS 6 ASTM A335 Grade P9 branch connection. The weld(s) were post weld heat treated. When should this section of piping be leak tested or should it be leak tested?

a. before and after the heat treatment
b. before the heat treatment
c. after the heat treatment
d. no test is required.

97. If a non-toxic flammable liquid is used as a leak testing medium, it must have:

a. at least a flash point of 120^0 F.
b. a boiling point of 150^0 F.
c. a vapor point of 100^0 F.
d. a Staybolt viscosity of 120 at 122^0 F.

98. Where the design temperature of the system is the same as the hydrostatic test temperature, the hydrostatic test pressure shall be not less than:

a. that calculated according to B31.3.
b. 1.1 times the design pressure.
c. 1.25 times the operating pressure.
d. 1.5 times the design pressure.

99. Calculate the hydrostatic leak test at 70^0 F. required for a piping system with NPS 6 ASTM A106 Grade B pipe that operates at a maximum of 600^0 F and 400 psi. Round to the nearest psi.

a. 500 psi
b. 600 psi
c. 694 psi
d. 440 psi

100. Where the test pressure of piping exceeds the a vessels test pressure, and it is not considered practicable to isolate the piping from a vessel, the piping and the vessel may be tested together at the vessel test pressure, provided the owner approves and the vessel test pressure is not less than _____ % of the piping test pressure calculated by ASME B31.3, paragraph 345.4.2(b).

a. 67
b. 77
c. 85
d. 110

101. If a pneumatic leak test is used, the test pressure shall be _____ % of design pressure.

a. 50
b. 150
c. 125
d. 110

102. If it becomes necessary to use a "Sensitive Leak Test" method, the test pressure shall be at least the lesser of _____ psi or _____ % of the design pressure.

a. 10, 33
b. 15, 25
c. 17, 23
d. 20, 20

103. Unless otherwise specified by the engineering design, the following records shall be retained for at least _____ years after the record is generated for the project: examination procedures, and examination personnel qualifications.

a. 10
b. 8
c. 5
d. 2

104. What is the longitudinal weld joint factor, E_j, for API 5L ERW (Electric Resistance Welded) pipe?

a. 1.00
b. 0.95
c. 0.85
d. 0.60

105. What is the casting quality factor, E_c, of a A216 carbon steel casting that is not upgraded per B31.3 paragraph 302.3.3(c) and Table 302.3.3C?

a. 0.85
b. 0.80
c. 0.75
d. 0.60

106. You have carbon steel pipe that has $\leq$ 0.3% carbon in it. What is its Modulus of Elasticity at 400^0 F.?

a. 30,000,000 psi
b. 31,900,000 psi
c. 29,000,000 psi
d. 27,700,000 psi

107. Double welded slip-on flanges should be _____ between the welds for fluid services that require leak testing of the inner fillet weld, or when fluid handled can diffuse into the enclosed space, resulting in possible failure.

a. sanded
b. machined
c. scored
d. vented

108. If a relief valve has a stop valve at the inlet or outlet. Is it permissible to close either or both these valves while the equipment the relief valve is protecting is in service.

a. It is not permissible to block off a relief valve while the equipment it is protecting is in operations.
b. It is permissible if an authorized person is present and this person can relieve the pressure by another means.
c. It is permissible to block off a relief valve while the equipment it is protecting is in a reduced operating mode, i.e. the operating pressure and/or temperature is reduced.
d. It is permissible to block off a relief valve only when the equipment it is protecting is not in operations.

109. Why would you not use cast iron material in the majority of cases in oil refinery or chemical plant applications?

a. The possibility of embrittlement when handling strong caustic solutions.
b. Its lack of ductility and its sensitivity to thermal and mechanical shock restricts its use.
c. The possibility of stress corrosion cracking when exposed to acids or wet H_2S.
d. The possibility of stress corrosion cracking if exposed to chlorides in H_2O > 50 ppm.

110. If you expose copper and copper alloys to ammonia, what would this possibly cause?

a. embrittlement
b. stress corrosion cracking
c. hydrogen attack
d. sulfidation

111. You have a fluid that does not operate at high pressure. The fluid is not toxic. The fluid is not flammable. Exposure to the fluid will not cause damage to human tissue. The design gage pressure is 120 psi and the operating temperature is 100^0 F. The owner requires metal piping to be used and he does not designate the category. No cyclic problems will occur. What category fluid service would you design?

a. Normal fluid service.
b. Category D fluid service.
c. Category M fluid service.
d. High pressure fluid service.

112. In elevated temperature service any condition of pressure and temperature under which the design conditions are not exceeded is known as the:

a. operating condition.
b. design condition.
c. extent of the excursions.
d. service life.

113. In elevated temperature service a condition under which pressure or temperature or both, exceed the design conditions is known as:

a. a design condition.
b. an operating condition.
c. an excursion.
d. a duration.

114. In elevated temperature service, the life assigned to a piping system for design purposes, in hours is known as the:

a. estimated life.
b. service life.
c. equivalent life.
d. excursion life.

115. The Inspector finds that ERW (electric resistance weld) pipe is used in a piping system. What longitudinal joint factor (E_j) would be used to calculate the required thickness for pressure?

a. 0.85
b. 0.60
c. 0.80
d. 0.90

116. The joint factor can not be increased by additional examination on which of the following longitudinal pipe joint:

a. Electric fusion weld, single butt weld, straight or spiral, without filler metal.
b. Electric fusion weld, double butt weld, straight or spiral.
c. Electric fusing weld, single butt weld, straight or spiral with filler metal.
d. Electric resistance weld, straight or spiral,

117. A NPS 10 pipe made from ASTM A106 Grade B carbon steel is to be checked for minimum thickness (t_m). The pipe operates at 900 degrees F. The existing thickness is 0.29". Determine the coefficient Y.

a. 0.4
b. 0.5
c. 0.6
d. 0.7

118. A NPS 10 pipe made from ASTM A53 Grade B carbon steel is to be checked for thickness (t). The pipe operates at 975 degrees F. The existing thickness is .29". Determine the coefficient Y.

a. 0.4
b. 0.5
c. 0.6
d. 0.7

119. "S" is defined as the stress value for material from Table A-1 of ASME B31.3. Pick the value of "S" when the material is ASTM A335 Grade P9 and the temperature is 950 degrees F.

a. 11400 psi
b. 10600 psi
c. 7400 psi
d. 20000 psi

120. An NPS 12 seamless pipe made from ASTM A-53 Grade B material operates at 600 psi and 600 degrees F. Calculate the pressure design thickness for these conditions.

a. 0.221"
b. 0.442"
c. 0.205"
d. 0.191"

121. An NPS 12 (12.75" o.d.) seamless pipe made from ASTM A-53 Grade B material operates at 600 psi and 600 degrees F. The conditions require that a corrosion allowance of 0.125" be maintained. Calculate the minimum required thickness for these conditions.

a. 0.218"
b. 0.346"
c. 0.330"
d. 0.436"

122. An NPS 4(4.5" o.d.) seamless pipe made from ASTM A-106 Grade A material operates at 300 psi and 400 degrees F. The pipe must cross a small ditch and it must be capable of supporting itself without any visible sag. A piping Engineer states that the pipe must be at least 0.25" thick just to support itself and the liquid product. He also states that a 0.10" corrosion allowance must be included. Calculate the thickness required for the pipe.

a. 0.292"
b. 0.392"
c. 0.350"
d. 0.142"

123. A blank is required between two NPS 8, 150 pound class flanges. The maximum pressure in the system is 285 psi at 100 degrees F. A corrosion allowance of 0.10" is required. The inside diameter of the gasket surface is 8.25". The blank is ASTM A-285 Grade C material. Calculate the thickness required for the blank.

a. 0.545"
b. 0.584"
c. 0.530"
d. 0.552"

124. Which of the below may only be used for category D fluid service?

a. ASTM A-333 Grade 6
b. API 5L Grade X46
c. ASTM A-106 Grade B
d. ASTM A-53 Grade F

B31.3 PRACTICE QUESTION ANSWER KEY

1. c ASME B31.3, INTRODUCTION
2. b ASME B31.3, INTRODUCTION
3. a ASME B31.3, INTRODUCTION
4. b ASME B31.3, 300(b)(1)
5. b ASME B31.3, 300(c)(1)
6. b ASME B31.3, 300(c)(2)
7. b ASME B31.3, 300(c)(6)
8. a ASME B31.3, 300.1.1(b)
9. c ASME B31.3, 300.2
10. d ASME B31.3, 300.2
11. a ASME B31.3, 300.2
12. b ASME B31.3, 300.2
13. c ASME B31.3, 300.2
14. a ASME B31.3, 300.2
15. b ASME B31.3, 300.2
16. a ASME B31.3, 300.2
17. c ASME B31.3, 300.2
18. c ASME B31.3, 300.2
19. c ASME B31.3, 300.2
20. d ASME B31.3, 300.2
21. c ASME B31.3, 300.2
22. c ASME B31.3, 301.2.1(a) & 302.2.4
23. d ASME B31.3, 301.2.2(a)
24. c ASME B31.3, 301.4.1
25. b ASME B31.3, 301.4.2
26. d ASME B31.3, 301.5.1
27. b ASME B31.3, 301.6.1
28. b ASME B31.3, 301.9
29. a ASME B31.3, Fig. 328.5.2A
30. c ASME B31.3, 341.5.1
31. d ASME B31.3, 300(c)(5)
32. b ASME B31.3, 304.1.1(b)
33. d ASME B31.3, 308.2.1(a)
34. c ASME B31.3, 308.2.1(b)
35. b ASME B31.3, 308.2.4
36. b ASME B31.3, 309.2.1
37. a ASME B31.3, 309.3
38. b ASME B31.3, 311.2.3(b)
39. a ASME B31.3, 311.2.4(a)
40. d ASME B31.3, 311.2.4
41. b ASME B31.3, 311.2.5(a) & (b)
42. b ASME B31.3, 311.2.6
43. c ASME B31.3, 312.1
44. c ASME B31.3, 312.2
45. b ASME B31.3, 313
46. a ASME B31.3, 314.1(a)
47. b ASME B31.3, 314.1(b)
48. b ASME B31.3, 319.2.4
49. c ASME B31.3, 328.5.2(A) & Fig. 328.5.2 B&C
50. d ASME B31.3, 328.6
51. d ASME B31.3, 331.2.1
52. b ASME B31.3, 331.2.5
53 b ASME B31.3, 340.1

54. a ASME B31.3, 340.2
55. a ASME B31.3, 340.4(b)
56. c ASME B31.3, 341.3.1(a)
57. c ASME B31.3, 341.3.1(b)(1)
58. a ASME B31.3, 344.2, 344.3, 344.4, 344.5, 344.6
59. c ASME B31.3, 344.5.2
60. d ASME B31.3, 344.7.1
61. d ASME B31.3, 344.7.2
62. b ASME B31.3, 345.1(a), 345.7
63. c ASME B31.3, Table 314.2.1, 314.2.1(a)
64. c ASME B31.3, 314.2.2
65. d ASME B31.3, 319.3.1(a) & Appendix C
66. a ASME B31.3, 319.3.1(a) & Appendix C
67. c ASME B31.3, 319.3.1(a) & Appendix C
68. a ASME B31.3, 319.3.2 & Appendix C
69. a ASME B31.3, 319.3.3
70. c ASME B31.3, 322.6.1(c) & Appendix F
71. d ASME B31.3, 322.6.3(b)(2)
72. b ASME B31.3, Table A-1 & Fig. 323.2.2
73. b ASME B31.3, 323.3.3
74. c ASME B31.3, 323.3.5, Table 323.3.5
75. d ASME B31.3, Fig. 328.4.3
76. a ASME B31.3, 328.5.4(c) & Fig. 328.5.4D
77. c ASME B31.3, 330.1.1 & Table 330.1.1
78. b ASME B31.3, 330.1.4
79. d ASME B31.3, 330.2.3 & Table 330.1.1
80. b ASME B31.3, 331.1.3
81. c ASME B31.3, 331.1.3 & Fig. 328.5.4D
82. c ASME B31.3, Table 331.1.1
83. b ASME B31.3, 331.1.7(a)
84. d ASME B31.3, 331.1.7(b)
85. b ASME B31.3, 332.2.1
86. b ASME B31.3, 332.2.1
87. a ASME B31.3, 335.1.1(a)
88. a ASME B31.3, 335.1.1(c)
89. c ASME B31.3, 335.1.1(c)
90. b ASME B31.3, 335.2.3
91. c ASME B31.3, 335.2.4
92. b ASME B31.3, Table 341.3.2A
93. b ASME B31.3, 341.3.4
94. c ASME B31.3, 345.2.1(c)
95. d ASME B31.3, 345.2.2(a)
96. c ASME B31.3, 345.2.2(b)
97. a ASME B31.3, 345.4.1
98. d ASME B31.3, 345.4.2(a)
99. c ASME B31.3, 345.4.2(b)
100. b ASME B31.3, 345.4.3(b)
101. d ASME B31.3, 345.5.4
102. b ASME B31.3, 345.8(a)
103. c ASME B31.3, 346.3
104. c ASME B31.3, Table A-1B
105. b ASME B31.3, Table A-1A
106. d ASME B31.3, Table C-6
107. d ASME B31.3, F308.2
108. b ASME B31.3, F322.6
109. b ASME B31.3, F323.4(a)

110. b ASME B31.3, F323.4(f)(2)
111. a ASME B31.3, Figure M-300
112. a ASME B31.3, V300.1
113. c ASME B31.3, V300.1
114. b ASME B31.3, V300.1
115. a ASME B31.3, 302.2.4
116. d ASME B31.34, 302.2.4, Table 302.3.4
117. a ASME B31.3, 304.1.1(b), Table 304.1.1
118. c ASME B31.3, 304.1.1(b), Table 304.1.1
119. b ASME B31.3, 304.1(b)
120. a ASME B31.3, 304.1.2(a)
121. b ASME B31.3, 304.1.2(a)
122. b ASME B31.3, 304.1.2(a)
123. a ASME B31.3, 304.5.3
124. d ASME B31.3, 305.2.1