API 575 Study Guide

API 653 Cert Prep

This following is a Study Guide that you can use to help you learn the details and content of **API RP-575, Inspection of Atmospheric and Low-Pressure Storage Tanks (3rd Edition-2014)**. There will be about 6-12 questions from this document on the API 653 exam. We do ***NOT*** spend time in class discussing this publication. So it is important that you become familiar with this content in your personal study sessions.

The questions in this Study Guide are in the same order as the information is given in API 575. The **Answer Key** is in the back of this guide (which includes References). When you study API 575, read a number of pages and then answer the corresponding questions. You want to keep practicing this Study Guide until you can score 80+%.

Open book questions are highlighted in yellow.

Section 2 – References *(API 575 pg 1-3)*

	Description of Code	Code
1	Old Code used to build riveted tanks	
2	Construction code for low-pressure tanks	
3	Construction code for atmospheric tanks	
4	Cathodic protection of tanks	
5	Tank linings	
6	Tank venting	
7	Safety precautions for tank entry (2 codes)	
8	UL tank Construction code	

Section 3 – Definitions *(API 575 pg 4-6)*

1. Per API 653, the generic definition of atmospheric pressure is pressures up to:

   a. 0.05 psig.
   b. 0.5 psig.
   c. 2.5 psig.
   d. 15 psig.

Section 4 – Types of Tanks *(API 575 pg 6-21)*

1. The inspection guidelines of API 572 should be followed when the operating pressure exceeds:

   a. 0.05 psig.
   b. 0.5 psig.
   c. 2.5 psig.
   d. 15 psig.

2. As the product temperature increases, the product's vapor pressure:

   a. decreases.
   b. decreases only if specific gravity is less than 1.0.
   c. increases.
   d. increases only if specific gravity is less than 1.0.

3. A pressure-vacuum vent is installed on a tank. The PV vent will ensure that the inside pressure or inside vacuum does ***not*** exceed:

   a. 0.0 psig.
   b. a few ounces per square inch.
   c. 2.5 psig.
   d. 15 ounces per square inch.
   e. 15 psig.

4. While in operation, which tank type roof is normally supported by internal members?

   a. Cone roof
   b. Dome roof
   c. Floating roof
   d. Umbrella

5. Fixed-roof tanks are often self-supporting when tank diameter does ***not*** exceed:

   a. 20 feet.
   b. 40 feet.
   c. 60 feet.
   d. 100 feet.

6. Which of the following is ***not*** an advantage of an umbrella roof or a geodesic dome roof?

   a. Low cost roof
   b. Keeps snow and rain off of an internal floating roof
   c. Can be used on any size of tank
   d. Does not require internal supports

7. What is the primary reason for using a floating roof instead of a cone roof tank?

   a. Less affected by severe weather
   b. Less expensive
   c. Less maintenance issues
   d. Minimizes vapor emissions

8. Which type of external floating-roof is the most susceptible to sinking?

   a. Double-deck
   b. Pan (Single-deck)
   c. Annular Pontoon

9. Which type of external floating-roof is the least susceptible to sinking?

   a. Double-deck
   b. Pan (Single-deck)
   c. Pontoon

10. Why are internal floating roofs sometimes used?

    a. Lowers construction costs
    b. Reduces vapor loss
    c. Minimizes effects of weather (rain & snow)
    d. Either reduces vapor loss or minimizes effects of weather (rain & snow)

11. Which is the most common type of floating-roof seal?

    a. Foam log
    b. Mechanical shoe
    c. Air bladder
    d. Wiper

12. Which of the following floating roofs is normally ***not*** constructed from steel?

    a. Double-deck
    b. Internal on floats
    c. Pan
    d. Pontoon

13. Low-pressure storage tanks are those with a design pressure from:

    a. 0.0 - 0.05 psig.
    b. 0.05 – 2.5 psig.
    c. 2.5 – 15 psig.
    d. 5.0 – 25 psig.

14. API 620 Appendix R provides design rules for refrigerated tanks with design temperatures between:

    a. -60 to 40 °F.
    b. -50 to 32 °F.
    c. -100 to 0 °F.
    d. -270 to -60 °F.

15. API 620 Appendix Q provides design rules for refrigerated tanks with design temperatures between:

    a. -60 to 40 °F.
    b. -50 to 32 °F.
    c. -100 to 0 °F.
    d. -325 to -60 °F.

16. Low-pressure storage tanks are normally used for products that have a:

    a. vapor pressure that exceeds limits of API 650.
    b. low vapor pressure.
    c. specific gravity that exceeds limits of API 650.
    d. low specific gravity.

17. Hemispheroidal, spheroidal, and noded spheroidal tanks are commonly used when the design pressure exceeds:

a. 2.5 psig.
b. 5.0 psig.
c. 10.0 psig.
d. 125.0 psig.

18. Which code covers refrigerated liquefied gas tank systems?

a. API 620
b. API 625
c. API 650
d. API 2201
e. UL-142

Section 5 – Reasons to Inspect *(API 575 pg 21-27)*

1. Regulatory requirements typically cover safety & environmental concerns. Some jurisdictions require what is called "RAGAGEP". RAGAGEP stands for:

a. Recognized And Generally Accepted Good Engineering Practice.
b. Rules And Guidelines Adopted by Governmental Enhanced Politics.
c. Requirements Accepted, Governed, Adopted by Geographic Engineering Professionals.
d. Run And Gun As Guided by Exceptional Performance.

2. Which of the following codes is ***not*** a tank inspection code:

a. API RP 12R1
b. API 653
c. STI SP001
d. UL-142

3. A tank pad is installed with cinders. What chemical in the cinders can cause bottom-side corrosion when the pad gets wet?

a. Chlorides
b. Iron
c. Kryptonite
d. Silicon
e. Sulfur

4. Which of the following is ***not*** a common cause of bottom-side corrosion on a tank floor?

   a. Clay or wood left in sand pad
   b. Faulty installation of sand pad
   c. Improperly sealed ring wall
   d. Leaking product that is corrosive
   e. Operating temperatures below 200 °F
   f. Poor drainage in tank area

5. In order to prevent bottom-side corrosion, which of the following is ***not*** recommended?

   a. Asphalt-impregnated fiberboard on top of ring-wall
   b. Assure pad materials are clean and salt free
   c. Install sand pad using specified ASTM materials that is 3-4" thick
   d. Installing tank foundation 12" above the tank dike grade

6. What are two common causes of severe external corrosion at the bottom of the lower shell course?

   a. _____

   b. _____

7. Concentration cell corrosion may occur in the many niches of:

   a. cone roof tanks.
   b. internal floating roof tanks.
   c. low-pressure tanks.
   d. riveted tanks.
   e. small diameter tanks.

8. Which document helps the inspector understand corrosion mechanisms?

   a. API 571
   b. ASME PCC-2
   c. ASTM SA-333
   d. NACE 1089

9. Most tanks are made from which metallurgy(s)?

   a. Carbon steel
   b. Chromes
   c. Carbon steel or chromes
   d. Kryptonite
   e. Austenitic stainless steel

10. Which of the following is ***not*** a common cause of corrosion in a tank's vapor space?

   a. Hydrogen sulfide vapor
   b. Oxygen
   c. Nitrogen
   d. Water vapor

11. Generally, in the liquid portion of a tank, internal corrosion is worse at the:

   a. bottom of the tank.
   b. top of the liquid.
   c. nozzles.
   d. welds.

12. Which of the following tank products does ***not*** cause stress corrosion cracking?

   a. Benzene
   b. Caustic
   c. DEA
   d. Ethanol

13. Occasionally a tank will be built with alloy materials. Which of the following is a common reason for selecting alloys to build a tank?

   a. High design temperature
   b. Increased strength
   c. Lower cost
   d. Maintain product purity

14. Stress corrosion cracking of austenitic SS can occur in the presence of:

    a. acids.
    b. chlorides.
    c. hydrocarbons.
    d. sulfides.

15. Horizontal uninsulated cylindrical tanks can sometimes experience accelerated external corrosion on:

    a. heads.
    b. longitudinal welds.
    c. nozzles.
    d. saddle-to-tank interface.
    e. shell-to-roof weld.

16. What type of tank failure has occurred in the past that results in a sudden and complete loss of the product?

    a. Brittle failure
    b. Failure at deep pitting
    c. Failure at a localized thin area
    d. Thermal fatigue

17. Which tank weld is most likely to have a leak that is the result of a weld defect?

    a. Annular plate butt welds
    b. Bottom fillet welds
    c. Horizontal shell welds
    d. Three-plate lap welds

18. Cracks are most likely to occur in which of the following welds?

    a. Bottom fillet welds
    b. Bottom-to-shell weld
    c. Horizontal shell welds
    d. Vertical shell welds

19. In which of the following areas are cracks least likely to occur?

    a. Around rivet holes
    b. Bracket welds
    c. Nozzle welds
    d. Roof fillet welds

20. What weld is most susceptible to cracking in a hot tank?

    a. Bottom fillet welds
    b. Bottom-to-shell weld
    c. Horizontal shell weld
    d. Roof-to-shell weld
    e. Vertical shell weld

21. A tank experiences excessive uniform tank settlement. Which area of the tank is most likely to be over-stressed?

    a. Nozzles
    b. Horizontal shell weld
    c. Roof-to-shell weld
    d. Vertical shell weld

22. Pressure-vacuum vents and flame arrestors can fail to operate for a variety of reasons. Which of the following is ***not*** a cause?

    a. Deposits by birds or insects (poop, mud, etc.)
    b. Corrosion between moving parts
    c. Fouled
    d. Ice in cold climates
    e. Product specific gravity is increased

23. A plugged floating roof drain:

    a. can cause the roof to sink.
    b. can cause excessive tank settlement.
    c. will significantly increase the stress in the shell.
    d. will increase the water in the bottom of the tank.

24. The inspection checklists listed in API 653 Appendix C are:

    a. mandatory for all tanks.
    b. mandatory only on low-pressure storage tanks.
    c. considered a "memory jogger" for the inspector.

Section 6 – Inspection Plans *(API 575 pg 27-29)*

1. An Inspection Plan is:
   a. recommended for tanks inspected using API 653.
   b. required for tanks inspected using API 653.
   c. recommended for tanks built to API 650.
   d. required for tanks built to API 650.

2. Which of the following is ***not*** needed in an Inspection Plan for a tank?
   a. Type of Inspection(s) needed
   b. Due date for each Inspection Type
   c. Estimated cost of the needed Inspections
   d. Extent and locations for any NDE
   e. Describe surface cleanliness requirements

3. Which of the following is ***not*** required to be included in an Inspection Plan?
   a. Name of individual that will perform the inspection
   b. Next inspection date
   c. Surface cleaning requirements
   d. Type of NDE that will be used

4. Which of the following is ***not*** required in an Inspection Plan?
   a. Routine lighting requirements
   b. Location where NDE will be performed
   c. Planned pressure tests
   d. Planned repairs

5. The Inspection Plan for a tank should be developed by:
   a. the Inspector.
   b. the Engineer.
   c. both the Inspector and the Engineer.
   d. a team that includes; Inspector, Engineer, Corrosion Specialist & Operations

6. During the development of an Inspection Plan, one of the most significant issues is to determine:

   a. Cost of recommended NDE.
   b. Types of anticipated damage.
   c. Location of anticipated damage.
   d. Both the types and location of any anticipated damage.

7. Which is ***most*** important when selecting type of NDE to use during an inspection?

   a. Ability of the method to find the anticipated damage mechanism
   b. Availability of NDE method
   c. Cost of NDE method
   d. Ease of use of the NDE method

8. All RBI assessments should be conducted in accordance with:

   a. API 571.
   b. API 579.
   c. API 580.
   d. ASME Section VIII, Div 2.

9. In the RBI process, what are the two primary factors used to determine risk?

   a. Consequence of Failure and Service Class
   b. Reliability and the On-stream Percentage
   c. Likelihood and Consequence of Failure
   d. Inspection Effectiveness and Corrosion Mechanism

10. During a risk evaluation, which of the following is ***not*** a factor during the evaluation of the Likelihood of Failure?

    a. Current condition of the tank
    b. Effectiveness of past inspections
    c. Location of environmental receptors
    d. Potential damage mechanisms

11. During a risk evaluation, which of the following is ***not*** a factor during the evaluation of the Consequence of Failure?

    a. Current thickness of tank components
    b. Environmental impacts
    c. Loss of production
    d. Process fluid(s)

12. All RBI assessments must be:

    a. repeated every 5 years.
    b. thoroughly documented.
    c. approved only by the Authorized Inspector.
    d. conducted per guidelines in API 579.

13. An RBI assessment is often used to:

    a. evaluate the effectiveness of the Tank Inspection Program.
    b. evaluate the effectiveness of Tank Operation.
    c. update Inspection Procedures.
    d. update or revise and Inspection Plan.

14. An RBI assessment has been conducted. Which of the following is ***not*** an outcome of the Assessment?

    a. Extent of NDE to perform during the next inspection
    b. Revision of jurisdictional requirements
    c. Inspection intervals
    d. Type of NDE method to use during the next inspection

15. Some inspection intervals are based on an RBI assessment. Others are based on the API 653 interval rules. The ones based on the API 653 interval rules are called:

    a. code-based.
    b. inspector-based.
    c. interval-based.
    d. jurisdictional-based.

Section 7 – Frequency of Inspection *(API 575 pg 30-36)*

1. Which of the following is ***not*** a leak detection technology?
   a. Acoustic Emission leak detection
   b. Capillary Soil leak detection
   c. Inventory Control leak detection
   d. Soil-Vapor monitoring leak detection

2. Leak detection technologies for tanks are discussed in:
   a. API 334.
   b. API 2001.
   c. ASNT CP-189.
   d. NACE 1169.

3. External CP should be:
   a. installed on all new tanks.
   b. installed on all tanks that are built on a sand pad.
   c. installed per API 2015.
   d. tested per API 651.
   e. tested per NACE CP-005.

4. Which document provides additional guidance on inspecting tank appurtenances and accessories?
   a. API 652
   b. API 2610
   c. NACE 45R96
   d. STI-008

5. Determine the corrosion rate occurring on a shell course based on this data.

	t_{min}	10/2016	4/2012
Thickness	0.525"	0.570"	0.588"

   a. 3.6 mpy (mils per year)
   b. 4.0 mpy
   c. 4.5 mpy
   d. 10 mpy

For more info on Corrosion Rates & Remaining Life, see our "The Inspector's Calcs" study guide in Module 8. These are your most important calculations !!!

6. Determine the Remaining Life for a shell course based on the following data.

	t_{min}	6/2003	6/2012	11/2016
Thickness	0.344″	0.422″	0.395″	0.368″

   a. 3 years
   b. 4 years
   c. 6 years
   d. 9 years

7. For new tanks built to API 650, the minimum new thickness for the shell:

   a. should never be less than ½″.
   b. considers only the shell stresses resulting from the product.
   c. considers only the shell stresses resulting from the hydrotest water.
   d. considers both the shell stresses resulting from the product and the hydrotest water.

8. The product in a tank creates:

   a. practically no stress over the entire floor.
   b. practically no stress in the floor away from the shell.
   c. equal stresses in floor and shell plates.
   d. stresses that are equal throughout the shell.

9. On a 120 foot diameter tank the:

   a. pressure is highest at the bottom of the shell.
   b. highest stresses are in the tank floor.
   c. shell plates will be the same thickness on each course.
   d. nozzles flanges should Class 300.

10. A large area on a shell course is corroded below acceptable limits. Which of the following is ***not*** an acceptable option?

   a. Replace the corroded area
   b. Lower the fill height
   c. Change to a product with a lower specific gravity
   d. Coat the corroded area with a lining

11. An isolated deep pit in the shell:

    a. does not appreciably weaken the shell.
    b. must always be repaired.
    c. never needs to be repaired.
    d. Should be evaluated per API 580.

12. Neither API 650 or API 653 have a method for determining the minimum required thickness of a tank's:

    a. annular plates.
    b. floor plates.
    c. nozzles.
    d. shell plates.

13. Roof supports are normally:

    a. designed per AISC's Steel Construction Manual.
    b. designed per API 650.
    c. made from 3/16" steel.
    d. made from pipe.

14. The internal inspection interval in API 653 is controlled by the corrosion on the:

    a. bottom.
    b. nozzles.
    c. shell.
    d. thinnest component.

15. What is an acceptable way of obtaining a suggested corrosion rate for tank components?

    a. Take a wild guess and run with it!
    b. Obtain corrosion rates from a Professional Engineer
    c. Obtain corrosion rates from NACE publications
    d. Use corrosion rates from tanks in Similar Service

16. Who is responsible for deciding whether to use Similar Service as an acceptable way to obtain a suggested corrosion?

    a. Corrosion Specialist
    b. Engineer
    c. Inspector
    d. Owner/User

17. Similar Service data is going to be used to analyze a tank bottom. Which of the following is true about the tank that is providing the Corrosion Rate Data?

    a. This tank must be at the same site as the Candidate Tank
    b. The tank must contain exactly the same process as the Candidate Tank
    c. One tank may provide soil-side corrosion rate data, and another tank provides top-side corrosion rate data
    d. One tank can always be found to provide the both the top-side and soil-side corrosion rate data

18. Similar Service corrosion rate data for soil-side corrosion:

    a. is always higher than top-side corrosion rate.
    b. should be from the same site as the Candidate Tank.
    c. is relatively easy to determine.
    d. is determined by finding the highest soil-side rate at a facility and multiplying it by 1.3.

19. The top-side corrosion rate is normally the result of:

    a. the corrosion from hydrocarbons stored in the tank.
    b. the corrosion from "water bottoms".
    c. galvanic corrosion.
    d. reaction with air when the tank is out-of-service.

20. Which of the following is often in the "water bottoms" and accelerates top-side corrosion?

    a. Bismuth
    b. Hydrogen
    c. Pepper
    d. Salt
    e. Sulfur

21. Which document can be used during fitness for service assessments?

    a. API 579
    b. API 580
    c. API 581
    d. API 2201

Section 8 – Methods of Inspection *(API 575 pg 36-66)*

1. Safety precautions dealing with tank entry are discussed in:
   a. API 2015 & 2016.
   b. API 2201.
   c. API 2601.
   d. USDA 4601.

2. Inspection paint or crayon markers used on SS should be free of:
   a. bromides.
   b. chlorides.
   c. oxides.
   d. sulfides.

3. Prior to entering a tank, be sure to:
   a. lock out all pumps near the tank.
   b. check condition of overhead structures inside the tank.
   c. review the API 653 Appendix C checklist.
   d. take external UT readings on the shell.

4. Prior to entering a floating roof tank, be sure to:
   a. check that there is not a significant amount of liquid on the roof.
   b. review tank entry guidelines specified in API 579.
   c. review the API 653 Appendix C checklist.
   d. take external UT readings on the roof.

5. Prior to conducting a tank inspection, the inspector should:
   a. read previous inspection records.
   b. obtain an API TES certification.
   c. obtain an API 650 certification.
   d. determine the shell joint efficiency.

6. Anchor bolts may be subject to what type of degradation?
   a. Calcining
   b. Corrosion/erosion
   c. Crevice corrosion
   d. Galvanic corrosion

7. Which handrail member should be given special attention?

   a. Angle iron
   b. Bars
   c. T-bars
   d. Tubular

8. Crevices in structural members should be checked with:

   a. UT.
   b. UT or RT.
   c. MT or PT.
   d. scrapper or hammer.

9. Low spots on a platform that collect water are routine places for corrosion to occur. This can be simply solved by:

   a. drilling a drain hole.
   b. replacing the platform.
   c. adding additional support to "cone-up" the platform.
   d. removing the platform and providing a rope to hang on to.

10. The external joint between the tank floor plate extension and a concrete foundation should be:

    a. covered.
    b. grouted.
    c. insulated.
    d. sealed.

11. Anchor bolt corrosion below the nut can be checked by using:

    a. acoustic emission.
    b. eddy current.
    c. hammer testing.
    d. RT.

12. Tank grounding connections should be checked:

    a. per API 651.
    b. per API 2601.
    c. with an ammeter.
    d. visually.

13. The resistance in tank grounding should ***not*** exceed:

    a. 5 ohms.
    b. 25 ohms.
    c. 50 ohms.
    d. 250 ohms.

14. Which document provides information concerning the use of tank grounding to prevent static electricity?

    a. API 545
    b. API 2006
    c. API 2015
    d. API 2201

15. Which coating problem is the most difficult to detect?

    a. Blister
    b. Bonding failure
    c. Holiday
    d. Graffiti

16. Paint blisters occur most often on which of the following tank parts?

    a. Plate extension
    b. Nozzles
    c. Roof
    d. Shady side of the tank

17. Paint blisters occur most often on which of the following tank parts?

    a. Anchor bolts
    b. Paint under insulation
    c. Nozzles
    d. Side of the tank with the most sunlight

18. A tank is insulated. Where is a likely spot for external shell corrosion?

    a. Nozzles
    b. Shady side of the tank
    c. Sunny side of the tank
    d. Top shell course

19. What technique(s) can be used to find hot spots in insulation?

    a. Acoustic Emission or Neutron back-scatter
    b. Acoustic Emission or EMAT
    c. Guided wave UT or EMAT
    d. Thermography or Neutron back-scatter

20. CUI in carbon steel is most aggressive at a temperature range of:

    a. 10 - 350 °F.
    b. 50 - 150 °F.
    c. 120 - 200 °F.
    d. 180 - 250 °F.

21. Where is a typical place for external corrosion on a tank shell?

    a. At the bottom of the shell
    b. Near the top
    c. Below a horizontal weld seam
    d. There is not a typical location for external shell corrosion

22. Which of the following is ***not*** a cause of corrosion at the bottom of a tank shell?

    a. Build-up of soil on shell
    b. Build-up of some foreign material on shell
    c. Leakage of a corrosion product
    d. Spalling of concrete ringwall

23. Rigorous hammer testing of the shell should:

    a. never be done.
    b. never be done on a tank that is in service.
    c. be done only by a ASNT technician.
    d. be done to stress relieve the hammer tester!

24. The upper shell of a floating roof tank has the potential for atmospheric corrosion on both sides. On floating roof tanks with uncoated shells, special attention should be given to the shell on the upper:

    a. 12″.
    b. 24″.
    c. 36″.
    d. shell course.

25. What is the best way to take UT thickness readings through a thin-film coating?

    a. Remove the coating at the examination point
    b. Subtract the thickness of the coating from the UT reading
    c. Use a multi-echo thickness scope
    d. Let someone else take the reading!

26. Stiffeners and wind girders are normally:

    a. hammer tested.
    b. visually inspected.
    c. hammer tested and visually inspected.
    d. not inspected.

27. If a crack is found in a wind girder, which technique should ***not*** be used to determine the extent of cracking?

    a. MT with prods
    b. MT with yoke and dry particles
    c. MT with yoke and wet particles
    d. PT

28. A tank is in caustic service. A very common place for caustic cracking is at:

    a. vertical shell welds.
    b. nozzle to shell welds.
    c. bottom-to-shell weld.
    d. connections for internal heating units.

29. Caustic and amine SCC shows up as:

    a. external cracks.
    b. internal cracks.
    c. external pits.
    d. internal pits.

30. Caustic that seeps out of a tank crack will appear as a:

    a. brown oxide.
    b. green goo.
    c. red deposit.
    d. white salt.

31. During an inspection of a caustic tank, cracking has been found at a couple of nozzles. The inspector develops a repair plan to weld these cracks. If the metal in the repair area is ***not*** thoroughly cleaned and neutralized what might occur during welding?

    a. Additional cracking
    b. Arc blow
    c. Creation of pyrophoric iron
    d. Small fire

32. Hydrogen blistering is most common on the tank's:

    a. bottom and shell.
    b. nozzles.
    c. roof and shell.
    d. heating coils.

33. Hydrogen blistering occurs on the tank's:

    a. external.
    b. internal.
    c. external or internal.
    d. roof.

34. Hydrogen blistering is most easily found by using:

    a. hammer testing.
    b. RT.
    c. UT scan.
    d. visual and by touch.

35. Hydrogen blistering can easily be found on the shell by:

    a. holding a flashlight perpendicular to the shell.
    b. holding a flashlight against the shell with the beam parallel to the shell.
    c. UT A-scan.
    d. MFL scan.

36. Which of the following is ***not*** evidence of a possible tank shell leak?

    a. Bulge on the shell
    b. Paint is missing
    c. Puddle of product at base of the tank
    d. Shell discoloration

37. Which of the following is ***not*** a cause of tank deformation?

    a. Defective vent
    b. Earthquake
    c. Exceeded product fill height
    d. Settlement
    e. Wind

38. Which of the following welds is least likely to crack as the result of tank deformation?

    a. Bottom-to-shell weld
    b. Horizontal shell welds
    c. Shell-to-Roof weld
    d. Vertical shell welds

39. When cracking is suspect in an area of tank deformation, which NDE is preferred?

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

40. How can rivets be checked for tightness?

    a. By lightly tabbing one side and holding a finger on the opposite side
    b. UT straight beam
    c. UT shear wave
    d. Visually

41. A suitable means of determining the overall integrity of the roof is:

    a. hammer testing.
    b. hammer testing or MFL.
    c. UT examination or hammer testing.
    d. UT examination or MFL.

42. Hammer testing the roof:

    a. is an adequate means to determine if the roof will support personnel.
    b. might knock roof scale into the product.
    c. is a suitable substitute for UT roof scans.
    d. should be done with a 4 lb hammer.

43. Planks used as a walkway on the roof should span at least:

    a. 2 rafters.
    b. 3 rafters.
    c. 10 ft.
    d. 20 ft.

44. When walking on a roof, it is advisable to walk:

    a. in the center of plates.
    b. on the weld seams.
    c. only if the roof thickness was verified with a few random spot UT readings.
    d. lightly.

45. A floating roof tank is in a volatile service. When walking on the floating roof, it is advisable:

    a. that the tank be high gauged.
    b. stay on top of the pontoons.
    c. to have two individuals on the roof at the same time.
    d. sneak a smoke!

46. A floating roof tank is in a volatile service and is half full. Which of the following is a requirement when walking on the floating roof?

    a. Only walk on planks.
    b. Perform a couple of spot UTs on the roof prior to walking on the roof.
    c. Personnel must wear respiratory equipment unless air is tested.
    d. Personnel on the roof must be tied off to the shell.

47. If the maximum operating level is exceeded on a floating roof tank:

    a. excessive tank settlement will occur.
    b. the stresses on horizontal welds will exceed that allowed by the code.
    c. the seal may be damaged.
    d. the roof drain will probably be damaged.

48. A blocked roof drain on a floating tank can cause:

    a. excessive hoop stresses on the tank shell.
    b. deformation of the roof pontoons.
    c. water to accumulate on in the bottom of the tank.
    d. the roof to sink.

49. A floating roof is sitting on its legs. A blocked roof drain can cause:

    a. excessive hoop stresses on the tank shell.
    b. deformation of the roof pontoons.
    c. water to accumulate on in the bottom of the tank.
    d. severe roof damage.

50. External roof corrosion is most common at:

    a. roof seams.
    b. roof depressions.
    c. the roof-to shell weld.
    d. rafter locations.

51. What is "doubling" of an UT instrument?

    a. The displayed reading is twice the actual thickness reading
    b. At least two UT readings are taken at each TML
    c. Total thickness at fillet weld's lapped area is twice the measured thickness
    d. The UT instrument takes both thickness and temperature measurements

52. Soil-to-air corrosion can affect tank farm piping. To check for soil-to-air corrosion, the soil around the pipe should be dug back about:

    a. 6 – 12 inches.
    b. 12 – 24 inches.
    c. 18 – 36 inches.
    d. 6 – 8 ft.

53. Which of the following is a possible cause for significant distortion of pipe that is connected to the tank?

    a. Excessive tank settlement
    b. Over filling the tank
    c. Nozzle corrosion
    d. Undersized flange class

54. Which of the following is a potential cause for significant distortion of pipe that is connected to the tank in colder climates?

    a. Frost heave of pipe supports
    b. Over filling the tank
    c. Nozzle corrosion
    d. Thinning of shell

55. What should be done if there is significant distortion discovered at a nozzle?

    a. Must examine entire distorted area with UT scan
    b. Must examine entire distorted area with PT
    c. Clean and examine the distorted area for cracks
    d. Clean and examine the distorted area for thinning

56. What is a common problem for flame arrestors?

    a. Excessive internal corrosion
    b. Internal caps melt
    c. Internal screens get plugged
    d. Incorrect flange class is used

57. Which of the following is ***not*** a common way for flame arrestors to get plugged?

    a. Bees, mud daubers or insects
    b. Corrosion build-up
    c. Tank over pressure
    d. Solidification of tank vapors

58. Which of the following is ***not*** a problem that can occur if a flame arrestor gets plugged?

    a. Floating roof sucks in
    b. Tank over pressures
    c. Tank roof-to-shell weld fails
    d. Tanks sucks in due to vacuum

59. When inspecting a pressure-vacuum vent, which of the following is ***not*** something that needs inspected?

    a. Check for the build-up of solids
    b. Check that moving parts are free to operate
    c. Check for corrosion
    d. Check vent sizing capacity

60. What is a reliable method for checking the bottom for soil-side corrosion?

    a. Lifting the tank
    b. MFL (magnetic flux leakage)
    c. Removal of a few floor coupons
    d. Spot UT

61. What is a useful method for checking the tank bottom for soil-side corrosion?

    a. Lifting the tank
    b. Removal of a few floor coupons
    c. Robotic inspection
    d. Spot UT's of a 36" grid

62. Which of the following is a primary advantage of the MFL floor scan?

    a. The technique requires little training
    b. Inexpensive to perform
    c. Significant portions of the bottom can be examined
    d. Thickness reading is highly accurate

63. A tank is lifted in order to repair the tank's foundation. Based on this activity, which of the following is correct?

    a. The tank will probably need to be hydrotested
    b. The foundation will need to be spark tested
    c. This repair must be approved by the inspector and engineer
    d. The concrete used in the repair should not slump more than 1-1/2"

64. The owner elects to tunnel under a tank to visually inspect a portion of the soil-side of the tank bottom. What is the primary problem with tunneling?

    a. Cave-ins
    b. Difficult to compact the fill
    c. Interference with CP systems
    d. Increases the likelihood of soil-to-air corrosion

65. Which of the following is ***not*** a reason for lifting a tank?

    a. 100% inspection of the soil-side of the tank floor
    b. Coat the bottom side of the floor
    c. Repair the foundation or pad
    d. Fillet weld the bottom seams on the soil-side

66. Which of the following is ***not*** a cause of internal roof corrosion?

    a. Corrosive product in the vapor space
    b. Pyrophoric iron
    c. Oxygen
    d. Water vapor

67. Sometimes roof coupons are cut out in order to check the condition of the roof rafters. Which of the following is correct when cutting roof coupons?

    a. The activity must be approved by the Engineer and Inspector
    b. Coupons must be at least 6" x 6"
    c. Coupons must have rounded corners
    d. Replacement plate must be stitch-welded at least 1" in every 12"

68. If a floating roof drain gets plugged, the:

    a. roof may sink.
    b. API 653 Inspector will ***not*** get blamed. *(and you believe in the Easter Bunny too!)*
    c. API 653 Inspector will win the lottery.
    d. API 653 Inspector will get a pay raise.

69. If there are leaks in a floating roof or the pontoons, which of the following is ***not*** likely to occur?

    a. The roof may sink.
    b. The roof may tilt and damage the seals and roof.
    c. The roof may tilt and turn upside down.
    d. More difficult to prep the tank for inspections.

70. Which of the following is ***not*** commonly installed on a floating roof?

    a. Cathodic Protection
    b. Drains
    c. Grounding Connections
    d. Guides

71. What is likely to occur to a floating roof tank that has landed on its legs and the drain is plugged?

    a. The roof collapses
    b. The roof sinks
    c. Excessive top side corrosion occurs
    d. The roof inspection will be performed with scuba gear!

72. During an outage, the floating roof drain lines should initially be pressure tested for ½ hour. The test should normally be conducted at:

    a. 2.5 psig.
    b. 5.0 psig.
    c. 15 psig.
    d. 30 psig.

73. If a drain line contains a swing joint, a second ½ hour pressure test should be conducted at:

    a. 2.5 psig.
    b. 5.0 psig.
    c. 15 psig.
    d. 30 psig.

74. What is the reason for a 2nd pressure test of a drain that has a swing joint?

    a. This is such an important test, that a double check is needed.
    b. The joint may be self-sealing at low pressures, but leaks at high pressures.
    c. The joint may be self-sealing at high pressures, but leaks at low pressures.
    d. Just a good way to collect more inspection man-hours.

75. When walking on an aluminum internal floating roof:

    a. it's best to add planking prior to walking on the tank.
    b. be sure to walk on the seams.
    c. take thickness readings prior to walking on the roof.
    d. it's best to use rope access and suspend from the ceiling.

76. Aluminum floating roof legs must be:

    a. at least 0.250" thick.
    b. should be designed per API 620.
    c. should be avoided in tanks with non-aluminum bottoms.
    d. electrically isolated to from carbon steel to prevent galvanic corrosion.

77. Once it is safe to enter a tank, what tank component(s) should checked first?

    a. Bottom
    b. Nozzles
    c. Roof and support system
    d. Shell
    e. Any part can be checked first

78. Normally internal tank corrosion is least likely to occur:

a. on the bottom.
b. at the liquid-level line.
c. inside nozzles.
d. in the vapor space.

79. Dry pyrophoric material can cause:

a. cracking.
b. general metal loss.
c. ignition.
d. pitting.

80. Pyrophoric material tends to collect on the:

a. floor and top-side of the rafters.
b. rafters and bottom side of roof.
c. nozzles (360 degrees).
d. shell.

81. Pyrophoric material should be:

a. air dried.
b. kept moist until removed.
c. removed with a dry vacuum.
d. removed per API 2201.

82. Handling pyrophoric material is discussed in:

a. API 653.
b. API 2015 & 2016.
c. NACE 92-432.
d. NACE 99-121.

83. In sour services, corrosion often occurs in the:

a. floor.
b. nozzles.
c. shell.
d. vapor space.

84. In sour services, corrosive vapors are formed when moisture and air mixes with:

a. chlorides.
b. halogens.
c. hydrocarbons.
d. hydrogen sulfide.

85. In a 98% sulfuric acid tank, corrosion often occurs in the:

a. floor.
b. top-side of the bottom.
c. vapor space.
d. vapor-liquid interface.

86. In a 98% sulfuric acid tank, corrosion often occurs at the vapor-liquid interface. This is the result of:

a. acid vapors.
b. hydrogen sulfide.
c. sulfidation.
d. water on top of the acid that creates a weaker acid.

87. In tanks that are rarely used, like pipeline breakout tanks, corrosion often occurs:

a. behind the tank seal.
b. inside nozzles.
c. at the center of the floor.
d. on the entire shell.

88. A tank has experienced a circumferential band of corrosion on the shell. Which area is often more susceptible to corrosion?

a. Bottom of band
b. Top of the band
c. Heat Affected Zones
d. Any longitudinal welds in the banded area

89. Some incomplete penetration on circumferential shell welds:

a. is allowed only during repairs or alterations.
b. is allowed only during repairs.
c. has always been rejectable.
d. was allowed in API 650 prior to the 7th edition.

90. Which of the following carbon steels are the most susceptible to hydrogen blistering?

a. Those with mill scale
b. Those with dissimilar materials
c. Those that are non-normalized
d. Those with laminations and slag inclusions

91. Caustic stress corrosion cracking becomes prevalent in a carbon steel caustic tank when the temperature exceeds:

a. 40 °F.
b. 125 °F.
c. 150 °F.
d. 200 °F.

92. A common way to completely inspect a tank floor is by:

a. MFL (Magnetic Flux Leakage.
b. MFL (Magnetic Flux Leakage) with UT follow-up in suspect areas.
c. Spot UT with a statistical evaluation.
d. Visual with a pit gauge.

93. Prior to performing a tank floor scan it is a good idea to have the:

a. grounding devices disconnected.
b. bottom sandblasted to a NACE 1 finish.
c. floating roof legs placed at the low leg settings.
d. scanning personnel tested to demonstrate their ability to use this equipment.

94. A statistical method is used to determine the probable minimum remaining thickness of a tank bottom. Typically how much of the bottom is scanned to gather info for the statistical analysis?

a. 0.2 – 5%
b. 0.2 – 10%
c. 5-10%
d. 5-25%
e. 10-25%

95. A statistical method is used to determine the probable minimum remaining bottom thickness. What part of the floor should be included in the statistical analysis?

a. Outer circumference by the shell
b. An "X" pattern across the tank
c. Samples around the tank not exceeding 32' apart
d. Center of the tank

96. When is a statistical analysis of a tank floor effective?

a. Tanks on pads that may have been contaminated with corrosion fluids
b. Tanks with a Galvanic CP system
c. Tanks on pads that have a number clay balls *(thanks Tankees for tracking that in our pad during installation!)*
d. Tanks on pads that have uniform consistency

97. Pits depth can be estimated by use of a:

a. mechanical pencil.
b. pocket knife.
c. pocket ruler.
d. thumb imprint in the pit.

98. Accelerated tank floor corrosion may occur at:

a. bulges.
b. depressions.
c. bulges or depressions
d. fillet welds.

99. MFL scanning equipment is useful for finding:

a. only top-side corrosion on non-coated floors.
b. only top-side & bottom-side corrosion on non-coated floors.
c. only top-side corrosion on coated and non-coated floors.
d. both top-side & bottom-side corrosion on coated & non-coated floors.

100. MFL scanning equipment may miss:

a. uniform corrosion.
b. bottom-side pits.
c. sharp small diameter isolated pits.
d. corrosion within 6" of a weld.

101. On the tank bottom, removing a coupon is an effective method for:

a. inspecting the tank floor.
b. determining root cause of soil-side corrosion.
c. determining root cause of product-side corrosion.
d. determining root cause of soil-side and product-side corrosion.

102. Which part of the tank shell is considered the highest stressed?

a. Shell near nozzles
b. Shell-to-bottom area
c. Shell-to-roof area
d. Vertical welds

103. A method to use when checking for shell cracks is to put penetrant on one side of the shell and developer on the other. How long might it take to detect a crack?

a. 10 minutes
b. 1 hours
c. 4 hours
d. 24 hours

104. One method used to check a tank lining is:

a. holiday testing.
b. MFL.
c. pressure test.
d. statistical analysis.

105. Which of the following makes a very "Bad Day" for an inspector? *(Note! If you miss this you are **not** ready for the API 653 exam.)*

a. During an internal inspection the bottom has no top-side corrosion.
b. When reviewing tank settlement readings, you finding that the whole tank has settled about 1/4". That's uniform settlement.
c. You calculate that the maximum corrosion rate on the shell is 0.0001 ipy. *(yes 0.1 mpy)*
d. You performed your first holiday test on a tank lining and found 537 *"holidays"*. Look what I found. Then someone points out that each of the holidays looks a bit "burned". And then they explain that these 537 "holidays" are the result of you having the detector's voltage set too high. You burned up a good lining. *(should have read the directions)*.

106. Which of the following methods should ***not*** be used on a glass-lined tank? *(Note! Another question if you miss, don't take the API 653 exam.)*

a. Hammer testing
b. Visual
c. Visual
d. Visual

107. What type of lined tanks should be painted on the outside with a unique color or a warning stenciled, that indicates this tank has a special lining?

a. All lined tanks
b. Glass-lined
c. Lead-lined
d. Rubber-lined

108. A band of corrosion around the entire tank shell is found on a cone roof tank. The corroded band is about 30' above the floor. The corrosion rate in this area is 4 mils per year (0.004 ipy). The roof support columns should also be inspected. What would you expect to see on these roof columns?

a. Corrosion throughout the columns
b. Corrosion at the 30' level, with a corrosion rate of 4 mils per year
c. Corrosion at the 30' level, with a corrosion rate of 8 mils per year
d. Corrosion at the 30' level, with an unpredictable corrosion rate

109. What is a good method for checking the soundness of the roof's structural members and check the tightness of roof bolting?

a. Eddy current
b. Light hammer taps
c. Hard hammer taps
d. 16 lb. sledge hammer taps

110. Steam heating coils should be inspected using either RT or UT to detect:

a. build-up of internal deposits.
b. caustic embrittlement.
c. condensate grooving.
d. hydrogen pitting.

111. A hydrotest is performed on a tank of high alloy. What is one major concern?

a. Chloride stress corrosion cracking
b. Dirt in the water that will settle on the tank floor
c. Flange rating of the nozzle flanges
d. Oxygen pitting in the vapor space

112. An air-test is substituted for a tank hydrotest. The air pressure should ***not*** exceed:

a. 2 inches of water.
b. 2 ounces per square inch.
c. 2 psig.
d. 15 psig. *(there it goes … a UFTR … an Unidentified Flying Tank Roof! Oops!)*

113. Vacuum box testing is being performed on the roof welds. What types of leaks might be missed?

a. Very small leaks
b. Large leaks
c. Very small leaks and large leaks
d. None will be missed. Any leak can be found with a vacuum box test.

Section 9 – Leak Testing *(API 575 pg 66-74)*

1. Which of the following is ***not*** a RPB (release prevention barrier)?

   a. Concrete reinforced pad
   b. Double bottom tank
   c. Effective bottom side CP
   d. Under-tank liner *(yes a diaper!)*

2. Advance leak detection systems are described in:

   a. API 334.
   b. API 445.
   c. API 650 Appendix H.
   d. API 2201.

3. Tank Hydraulic Integrity:

   a. today should be achieved by building new tanks with a double bottom.
   b. can only be assured if CP has been installed.
   c. means the tank has not settled in a swampy area.
   d. is just a fancy way to say *"the tank is not leaking"*.

4. When visual inspection is performed, the inspector's eyes should be within:

   a. 12 inches of the surface to be examined.
   b. 24 inches of the surface to be examined.
   c. 36 inches of the surface to be examined.
   d. as close as the inspector's truck can get to the surface to be examined.

5. When visual inspection is performed, the inspector's eyes should be looking relatively straight-on to the surface. When inspecting the surface the inspector's eyes should ***not*** be at an angle that is less than:

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

6. When visual inspection is performed, the amount of light needed for general viewing should be at least:

   a. 15 foot-candles.
   b. 30 foot-candles.
   c. 50 foot-candles.
   d. 100 foot-candles.

7. When visual inspection is performed, the amount of light needed for inspecting small anomalies should be at least:

   a. 15 foot-candles.
   b. 30 foot-candles.
   c. 50 foot-candles.
   d. 100 foot-candles.

8. A high-penetrating oil is used to check the initial weld pass on one side of the bottom-to-shell weld. The minimum dwell time for this wicking test is:

   a. 10 minutes.
   b. 1 hour.
   c. 4 hours.
   d. 24 hours.

9. A tank floor is tested with a type of Bubble Test examination. In this test, an indicator solution is sprayed on the top-side of the floor and low pressure air is added under the floor. The air pressure for this test should ***not*** exceed:

   a. 1 inch of water.
   b. 3 inches of water.
   c. 2.5 psig.
   d. 15 psig.
   e. 750 mm of mercury

10. A tank floor is tested with another type of Bubble Test examination. In this test, about 6" of water is added inside the tank and low pressure air is added under the floor. The air pressure for this test should ***not*** exceed:

    a. 1 inch of water.
    b. 3 inches of water.
    c. 9 inches of water
    d. 2.5 psig.
    e. 1250 mm of mercury

11. The effectiveness of a tank floor Bubble Test can be improved by:

    a. increasing the pressure.
    b. increasing the duration of the examination.
    c. tapping the entire bottom with an air operated hammer.
    d. pulsating the air pressure.

12. Another variation of the Bubble Test examination is to build a clay dam around the tank and add water under the tank. (this is basically a *"Reverse Hydro")* The height of the water in the dam must be at least:

    a. 6 inches above the highest point in the floor.
    b. 12 inches above the highest point in the floor.
    c. 24 inches above the highest point in the floor.
    d. 36 inches above the highest point in the floor *(Anchors away !!!).*

13. When performing a Magnetic Particle examination, discontinuities are most evident:

    a. in stainless steels.
    b. when the discontinuity is perpendicular to the magnetic flux.
    c. when the discontinuity is parallel to the magnetic flux.
    d. when the discontinuity is subsurface.

14. Another method to test a tank floor is to inject an inert gas on the bottom-side of the tank floor and use a gas detector on the top-side. A common gas for this test is:

    a. Argon.
    b. Carbon dioxide.
    c. Helium.
    d. Hydrogen Sulfide.

15. A special leak detection method is called Volumetric Technology. The key measurements in this technology are:

    a. Liquid Level and Pressure.
    b. Liquid Level and Temperature.
    c. Pressure and Mass.
    d. Mass and Temperature.

16. Another special leak detection method is called Mass Balancing Technology. The key measurements in thistechnology are:

    a. Liquid Level and Pressure.
    b. Liquid Level and Temperature.
    c. Pressure and Temperature.
    d. Mass and Pressure.

17. Another leak detection method is called the Chemical Marker Technology. Which of following best describe this method?

    a. Chemical is added below the floor and chemical detection tools are used inside the tank.
    b. A colored chemical is added below the tank and visual examination is performed on the top-side to find bleed-through.
    c. Chemical is sprayed on the top-side of the tank, and detectors tubes are spaced on the bottom-side for air sampling.
    d. Chemical is added to either the hydrotest water, or the tank's product. Detectors tubes are spaced on the bottom-side for air sampling.

18. When the Chemical Marker Technology is used, the typical inoculation concentration is:

    a. 1 to 10 parts per million.
    b. 40 to 125 parts per million.
    c. 0.5%.
    d. 1.0%.

19. With Chemical Marker Technology, every part of the bottom should be within:

    a. 3 feet from a detection tube.
    b. 10 feet from a detection tube.
    c. 20 feet from a detection tube.
    d. 32 feet from a detection tube.

20. Acoustic Emission (AE) can also be used to determine if a tank floor is leaking. AE is based upon:

    a. detection of leaking tracer chemical.
    b. hearing sound from a leak.
    c. measuring slight changes in liquid height.
    d. using ultrasonic sound to find the leak.

21. Acoustic Emission (AE) is being used to check for a tank leak. If a number of sensors are used then:

    a. the exact location of a leak can be determined.
    b. only the general area of a leak can be determined.
    c. there is a 100% confidence level that any leaks will be found.
    d. any noise detected by all sensors is a leak.

22. The sensor used in Acoustic Emission is called a(n):

    a. Accelerometer.
    b. Acoustometer.
    c. Ammeter.
    d. Transducer.

23. What is a primary limitation of the Acoustic Emission technique?

    a. Ability to distinguish sound from a leak from other background noise
    b. Inability to determine whether a leak was caused from top-side or bottom-side corrosion
    c. Ability to determine the general location of a leak
    d. Difficulty in calibrating a sensor

Section 10 – Repairs & Alterations *(API 575 pg 75-79)*

1. All crack-like flaws found during an inspection:
   a. can be ignored if they are in a lower stressed components.
   b. must be repaired.
   c. must be repaired in a manner that prevents the crack from reoccurring.
   d. should be repaired they are deemed acceptable per a fitness-for-service evaluation.

2. The seam on a riveted tank has started to leak. Which of the following is ***not*** an acceptable repair method?
   a. Caulking
   b. Epoxy coating after an abrasive blast
   c. Re-riveted
   d. Soldered
   e. Welding.

3. The seam on a riveted tank has started to leak. The plan is to repair by welding. What must be part of the repair plan?
   a. Use large diameter electrodes
   b. Set the welding machine for high amperage
   c. Use back-step bead application
   d. Weld with one pass

4. The seam on a riveted tank has started to leak. The plan is to repair by welding. What should be part of the repair plan?
   a. Use small diameter electrodes
   b. Set the welding machine for high voltage
   c. Use large weld beads
   d. Weld with a minimum of 3 passes

5. On a riveted tank, some leaks have developed around a few rivet heads. Which of the following is a common problem when preforming weld repairs?
   a. Welds often crack when welding older materials
   b. Heat from welding can cause additional leaks in adjacent rivets
   c. Welding rivet heads creates notches that are stress risers
   d. It is difficult to inspect or test these fillet welds

6. A tank floor is being replaced due to product-side corrosion. Currently the bottom-side of the tank is protected by CP. During this repair the:
   a. shell should be slotted 6-12" above the old floor.
   b. floor thickness should be increased to ≥ 3/8".
   c. old floor should be removed.
   d. concrete must be installed between the old and new floors.

7. When locating a door sheet, which of the following is true?
   a. Locate the door sheet in an area where the bottom is relatively level for a distance of 5 feet on either side of the door sheet.
   b. Door sheets should not cut through any vertical welds.
   c. Door sheets should not extend all the way to the bottom-to-shell weld.
   d. Door sheets should not be wider than 10 feet.

8. Cutting a door sheet all the way down to the bottom-to-shell weld:
   a. is not allowed.
   b. may end up requiring a hydrotest to be performed.
   c. requires Owner/Operator approval.
   d. always requires extra bracing to be installed.

Section 11 – Records *(API 575 pg 80-81)*

1. Tanks records should:
   a. be updated quarterly.
   b. maintained throughout the service life of the tank.
   c. maintained at least 5 years after a tank is retired.
   d. always be updated by an Authorized API 653 inspector.

2. Tank records:
   a. must be all upgraded to an electronic format.
   b. should always be managed by an Authorized API 653 inspector.
   c. should be readily available at the tank facility.
   d. need to cover only the results of Internal & External inspections.

Annex A – NDE *(API 575 pg 82-83)*

1. Dual-element UT transducers have the ability to measure thin sections from:

   a. 0.025" – 1.000".
   b. 0.025" – 2.000".
   c. 0.050" – 0.500".
   d. 0.050" – 1.000".
   e. 40°F to 125°F. *(Oops, right answer for a different question!)*

2. Which of the following is correct concerning the use of dual-element UT transducers?

   a. If wall thicknesses less than 0.100" the meter accuracy is +/- 10%.
   b. If thickness < 0.050", the meter will provide no reading or a false reading.
   c. These transducers are used in the "Echo-to-Echo mode".
   d. These transducers are commonly used in Phased Array inspections.

3. Which of the following is ***not*** an advantage of a Single-crystal UT transducers?

   a. Possible to determine wall thickness even with coatings up to 0.100".
   b. Can be used in the "Echo-to-Echo mode".
   c. Has very good resolution for small diameter deep pits.

4. performed the recommended minimum transducer overlap between scanning passes is:

   a. 5% of the transducer diameter.
   b. 10% of the transducer diameter.
   c. 25% of the transducer diameter.
   d. 0.250".

5. When UT scanning is performed, larger diameter transducers:

   a. will not find small diameter deep pits.
   b. are more difficult to calibrate (compared to smaller transducers).
   c. have a slower maximum scanning speed (compared to smaller transducers).
   d. work best in the "Echo-to-Echo mode".

6. Phased Array Ultrasonics is often used:

   a. also as a PMI tool.
   b. as a substitute for RT after weld repairs.
   c. for thickness mapping and detection of mid-wall discontinuities.
   d. for solving world hunger.

7. Angle Beam Ultrasonics is often used:

   a. also as a PMI tool.
   b. as a substitute for RT after weld repairs.
   c. for thickness mapping and detection of mid-wall discontinuities.
   d. to provide a C-Scan image.

8. MFL floor scans typically cover:

   a. 80% of the floor.
   b. 85% of the floor.
   c. 90% of the floor.
   d. 98% of the floor.

9. A robotic tool is used to scan the floor while the tank is in service. Which of the following is true?

   a. This scan normally covers about 80% of the floor.
   b. This is relatively an inexpensive floor scan.
   c. This tool normally uses Eddy Current technology.
   d. Data from the scan is inputted into a statistical model to project the thinnest remaining thickness of the bottom.

Annex C – Qualifying Bottom Scanning *(API 575 pg 89-94)*

This content is also in API 653 Annex G. Very important to understand this Annex !!!!

1. Annex C covers qualifying:
   a. bottom scanning procedures.
   b. personnel performing a bottom scan.
   c. both bottom scanning procedures & personnel performing a bottom scan.
   d. all NDE procedures used to examine the bottom.
   e. both all NDE procedures used to examine the bottom & all NDE personnel that examine the bottom.

2. Why was Annex C developed?
   a. Another way developed for API to collect our hard-earned money.
   b. NDE personnel often don't apply themselves during training. So having them pass a test gives them more incentive to learn.
   c. To ensure that floor scanning personnel are familiar with the safety requirements for tank entry.
   d. Floor scanning is complex. The Owner/Operator will not generally be able to determine in the field if a bottom scan was effective.

3. Concerning bottom scans, what are "essential variables"?
   a. This is complete list of everything that needs to be listed in a bottom scanning procedure.
   b. Something on a bottom scanning procedure that cannot be changed.
   c. Something on a bottom scanning procedure that if changed requires the procedure and operator to be requalify (perform another test).
   d. These are the only items in a bottom scanning procedure that must be followed.

4. Concerning bottom scans, what are "non-essential variables"?
   a. Something on a bottom scanning procedure that if changed does not requires the procedure or the operator to be requalify.
   b. Something on a bottom scanning procedure that if changed requires the procedure and operator to be requalify.
   c. These are items that do not need to be listed in a bottom scanning procedure.
   d. These are items that do not need to be followed in a bottom scanning procedure.

5. What variables need to be listed in a Tank Bottom Examination Procedure (TBP)?

   a. Only essential variables
   b. Only non-essential variables
   c. Both essential and non-essential variables
   d. Only the variables required by the Owner/Operator

6. The Tank Bottom Examination Qualification Record (TBEQ) is a record of the bottom scanner's qualification test. What needs be listed in a TBEQ?

   a. Only essential variables
   b. Only non-essential variables
   c. Both essential and non-essential variables
   d. The essential variables and the results of the qualification test

7. The Tank Bottom Procedure Qualification Record (TBPQ) is a record of the bottom scanning procedure's qualification test. What needs be listed in a TBPQ?

   a. Only essential variables
   b. Only non-essential variables
   c. Both essential and non-essential variables
   d. The essential variables and the results of the qualification test

8. Each company (Authorized Inspection Agency) doing bottom scans should:

   a. have a Tank Bottom Examination Procedure (TBP).
   b. have a TBP and follow the TBP during field exams.
   c. have qualified their own TBP and during scans follow the qualified TBP.
   d. have qualified their own TBP, during scans follow the qualified TBP test, and register their TBP with API.

9. What is the purpose of a TBP?

   a. Provides direction for examiners and allows the Owner/Operator to verify that the examiner is correctly performing the examination.
   b. Provides direction for examiners that perform a bottom examination.
   c. Allows the Jurisdiction to verify that the examiner is correctly performing the examination entry.
   d. Provides acceptance criteria for a tank bottom scan.

10. Who should develop a Tank Bottom Examination Procedure (TBP)?

    a. API has standardized qualified TBP's that can be used
    b. Authorized Inspection Agency that does the Tank Internal Inspection
    c. Company that does the Tank Bottom Scan
    d. Jurisdiction
    e. Owner/Operator

11. Each Tank Bottom Examination Procedure (TBP) should specify:

    a. only essential variables specified listed in API 653.
    b. both essential and non-essential variables listed in API 653.
    c. both essential and supplemental essential variables listed in API 653.
    d. only essential variables specified listed in ASME Section IX.
    e. both essential and non-essential variables listed in ASME Section IX.

12. Sam, a bottom scanning examiner, has been qualified by ACME Tank Scanners using a MFL machine called the Ultimate Scanner - A1. Sam leaves ACME to work for Big Can Floor Scans. Which of the following is true?

    a. Sam's qualifications from the prior company, ACME, all still active.
    b. Sam's qualifications from the prior company, ACME, are active only if the new company, Big Can Floor Scans, is using the same equipment, the Ultimate Scanner – A1.
    c. Big Can Floor Scans must requalify Sam.
    d. Big Can Floor Scans should requalify Sam.

13. Each scanning operator should receive a minimum of:

    a. 40 hours of training.
    b. 60 hours of training.
    c. 100 hours of training.
    d. 160 hours of training.

14. Which of the following does ***not*** need to be included in the scanning operator's training?

    a. Calibration of the Scanning Equipment
    b. Estimated costs & pricing for using the Scanning Equipment
    c. Hands-on Practice with the Scanning Equipment
    d. Limitations of the Scanning Equipment
    e. Principles of Operation of the Scanning Equipment

15. Each scanning operator should be tested with a written exam. The exam should have a minimum of:

    a. 25 questions.
    b. 40 questions.
    c. 50 questions.
    d. 100 questions.
    e. 150 questions.

16. Which of the following does ***not*** need to be included in a TBEQ?

    a. Essential Variables
    b. Non-Essential Variables
    c. Number of Training Hours
    d. Qualification Test Results
    e. Test Score on the Written Exam

17. Who should certify (sign) a TBEQ?

    a. API ICP Group
    b. Authorized Inspection Agency
    c. Authorized Inspection Agency and the company performing the test
    d. Company that performs the test and the Jurisdiction
    e. Owner/Operator and the Authorized Inspection Agency

18. A tank bottom-scanning examiner should be requalified when the examiner has ***not*** performed a bottom scan within:

    a. 1 month.
    b. 3 months.
    c. 6 months.
    d. 12 months.
    e. whenever anything changes on the TBP.

19. A tank bottom-scanning examiner should be requalified when the examiner has ***not*** used a specific TBP within:

    a. 1 month.
    b. 3 months.
    c. 6 months.
    d. 12 months.
    e. whenever anything changes on the TBP.

20. A tank bottom-scanning examiner should be requalified whenever the employer has reason to question:

    a. His ability.
    b. Her ability.
    c. His or Her ability.
    d. His ability … Period. Never question a woman's ability!!!!!

21. Whenever a tank bottom scanning qualification test is being performed, the sample plate must:

    a. be at least 70 ft^2.
    b. be coated.
    c. have at least 20 underside pits.
    d. have underside pits, topside pits, locally thinned area and one underside crack.

22. Whenever a tank bottom scanning qualification test is being performed, the sample plate must have at least 5 underside :

    a. pits where the remaining thickness is < 0.050".
    b. pits where the remaining thickness is greater than 0.050" and less than ½ nominal bottom plate thickness.
    c. pits where the remaining thickness is greater than 1/2 nominal bottom plate thickness to less than 2/3 nominal bottom plate thickness.
    d. locally thinned areas.

23. Test pits on the sample plate for a bottom scanning qualification test should be:

    a. conical.
    b. flat bottomed.
    c. hemispherical with a depth to diameter ratio of 20-50%.
    d. hemispherical with a depth to diameter ratio of 40-80%.

24. A tank bottom scanning qualification test is being performed. What is the minimum required number of product side pits?

    a. 2
    b. 4
    c. 6
    d. 12

25. A tank bottom scanning qualification test is being performed. How many areas should represent general soil-side corrosion?

a. 1
b. 2
c. 3
d. 5

26. A tank bottom scanning qualification test is being performed. In order to pass this exam, how many to the pits must be detected where the remaining thickness is less than 0.050"?

a. 75%
b. 85%
c. 90%
d. 100%

27. A tank bottom scanning qualification test is being performed. In order to pass this exam, how many to the areas of general corrosion must be detected?

a. 75%
b. 85%
c. 90%
d. 100%

28. A tank bottom examiner who does UT prove-up is being qualified on an uncoated sample floor. In order to pass this exam, the examiner must determine the flaw depth within +/-:

a. 0.005".
b. 0.010".
c. 0.020".
d. 10% of the flaw depth.
e. 25% of the flaw depth.

29. A tank bottom examiner who does UT prove-up is being qualified on a sample floor that has a 15 mil coating. In order to pass this exam, the examiner must determine the flaw depth within +/-:

a. 0.025".
b. 0.030".
c. 0.050".
d. 25% of the flaw depth.

30. A tank bottom scanning examiner is being qualification on an uncoated test bottom plate that is 0.250" thick. If the examiner passes the test, what plate thickness is this examiner qualified to examine?

a. 0.100" - 0.250"
b. 0.120" – 0.300"
c. 0.125" – 0.375"
d. 0.200" – 0.380"

31. A tank bottom scanning examiner is being qualification on an uncoated test bottom plate that is 0.375" thick. If the examiner passes the test, what plate thickness is this examiner qualified to examine?

a. 0.100" - 0.375"
b. 0.150" – 0.400"
c. 0.245" – 0.425"
d. 0.250" – 0.500"

32. A tank bottom scanning examiner is being qualification on a test bottom plate that has a coating that is 0.050" thick. If the examiner passes the test, what coating thickness is this examiner qualified to examine?

a. Any thickness
b. Coatings < 0.100" thick
c. Coating thicknesses between 0.020" and 0.060"
d. Coating thicknesses between 0.030" and 0.070"
e. Coating thicknesses between 0.030" and 0.080"

33. Essential variables must be listed on the:

a. TBP
b. TBPQ
c. TBEQ
d. TBP & TBPQ
e. TBP & TBEQ
f. TBPQ & TBEQ

34. Non-Essential variables must be listed on the:

a. TBP
b. TBPQ
c. TBEQ
d. TBP & TBPQ

API 575 Study Guide – Answer Key

API 653 Cert Prep

Section 2

1. *API 12A*
2. *API 620*
3. *API 650*
4. *API 651*
5. *API 652*
6. *API 2000*
7. *API 2015, API 2016*
8. *UL-142*

Section 3

1. *c (3.3)*

Section 4

1. *d (4.1)*
2. *c (4.2.2)*
3. *b (4.2.2)*
4. *a (4.2.3)*
5. *c (4.2.3)*
6. *a (4.2.3) Not clearly mentioned*
7. *d (4.2.3)*
8. *b (4.2.3)*
9. *a (4.2.3) Not clearly mentioned*
10. *d (4.2.3)*
11. *b (4.2.3)*
12. *b (4.2.3.e)*
13. *c (4.3.1)*
14. *a (4.3.1)*
15. *d (4.3.1)*
16. *a (4.3.2)*
17. *b (4.3.3)*
18. *b (4.3.4)*

Section 5

1. *a (5.1.4)*
2. *d (5.1.4)*
3. *e (5.2.1)*
4. *e (5.2.1)*
5. *a (5.2.1)*
6. *a) settlement so that soil contacts shell (5.2.1)*
   b) CUI – water wicking (5.2.1)
7. *d (5.2.1)*
8. *a (5.2.2)*
9. *a (5.2.2)*
10. *c (5.2.2)*
11. *a (5.2.2)*
12. *a (5.2.2)*
13. *d (5.3)*
14. *b (5.3)*
15. *d (5.3)*
16. *a (5.4)*
17. *d (5.4)*
18. *b (5.4)*
19. *d (5.4)*
20. *b (5.4)*
21. *a (5.4)*
22. *e (5.5)*
23. *a (5.5)*
24. *c (5.5)*

Section 6

1. *a (6.1)*
2. *c (6.1)*
3. *a (6.1)*
4. *a (6.1)*
5. *d (6.2)*

6. *d (6.2)*
7. *a (6.2)*
8. *c (6.2.1.1)*
9. *c (6.2.1.1)*
10. *c (6.2.1.2)*
11. *a (6.2.1.3)*
12. *b (6.2.1.4)*
13. *d (6.2.1.5)*
14. *b (6.2.1.5)*
15. *c (6.2.2)*

Section 7

1. *b (7.1)*
2. *a (7.1)*
3. *d (7.1)*
4. *b (7.1)*
5. *b (7.2 – see calc on page 57)*
6. *b (7.2 – see calc on page 57)*
7. *d (7.2)*
8. *b (7.2)*
9. *a (7.2)*
10. *d (7.2)*
11. *a (7.2)*
12. *c (7.2)*
13. *a (7.2)*
14. *a (7.3)*
15. *d (7.3)*
16. *d (7.3)*
17. *c (7.3)*
18. *b (7.3)*
19. *b (7.3)*
20. *d (7.3)*
21. *a (7.4)*

Section 8

1. *a (8.1)*
2. *b (8.1 – Table 1)*
3. *b (8.1)*
4. *a (8.1)*
5. *a (8.1)*
6. *c (8.2.1)*
7. *d (8.2.1)*
8. *d (8.2.1)*
9. *a (8.2.2)*
10. *d (8.2.3)*
11. *c (8.2.4)*
12. *d (8.2.5)*
13. *b (8.2.5)*
14. *a (8.2.5)*
15. *b (8.2.6)*
16. *c (8.2.6)*
17. *d (8.2.6)*
18. *b (8.2.7)*
19. *d (8.2.7)*
20. *c (8.2.7)*
21. *a (8.2.8.1)*
22. *d (8.2.8.1)*
23. *b (8.2.8.1)*
24. *b (8.2.8.2)*
25. *c (8.2.8.2)*
26. *c (8.2.8.3)*
27. *a (8.2.8.3)*
28. *d (8.2.8.4)*
29. *b (8.2.8.4)*
30. *d (8.2.8.4)*
31. *a (8.2.8.4)*
32. *a (8.2.8.5)*

33. *c (8.2.8.5)*
34. *d (8.2.8.5)*
35. *b (8.2.8.5)*
36. *a (8.2.8.6)*
37. *c (8.2.8.6)*
38. *b (8.2.8.6)*
39. *a (8.2.8.6)*
40. *a (8.2.8.7)*
41. *d (8.2.9)*
42. *b (8.2.9)*
43. *a (8.2.9)*
44. *b (8.2.9)*
45. *a (8.2.9)*
46. *c (8.2.9)*
47. *c (8.2.9)*
48. *d (8.2.9)*
49. *d (8.2.9)*
50. *b (8.2.9)*
51. *a (8.2.9)*
52. *a (8.2.10)*
53. *a (8.2.10)*
54. *a (8.2.10)*
55. *c (8.2.10)*
56. *c (8.2.10)*
57. *c (8.2.10)*
58. *a (8.2.10)*
59. *d (8.2.10)*
60. *b (8.3.1)*
61. *c (8.3.1)*
62. *c (8.3.1)*
63. *a (8.3.1)*
64. *b (8.3.1)*
65. *d (8.3.1)*
66. *b (8.3.3)*
67. *c (8.3.3)*
68. *a (8.3.3)*
69. *c (8.3.3)*
70. *a (8.3.3)*
71. *a (8.3.3)*
72. *d (8.3.3)*
73. *b (8.3.3)*
74. *c (8.3.3)*
75. *a (8.3.3)*
76. *d (8.3.3)*
77. *c (8.4.2)*
78. *c (8.4.2)*
79. *c (8.4.2)*
80. *a (8.4.2)*
81. *b (8.4.2)*
82. *b (8.4.2)*
83. *d (8.4.3)*
84. *d (8.4.3)*
85. *d (8.4.3)*
86. *d (8.4.3)*
87. *a (8.4.3)*
88. *c (8.4.3)*
89. *d (8.4.3)*
90. *d (8.4.3)*
91. *c (8.4.3)*
92. *b (8.4.4)*
93. *d (8.4.4)*
94. *b (8.4.4)*
95. *a (8.4.4)*
96. *d (8.4.4)*
97. *a (8.4.4)*
98. *b (8.4.4)*

99. *d (8.4.4)*
100. *c (8.4.4)*
101. *b (8.4.4)*
102. *b (8.4.5)*
103. *d (8.4.6)*
104. *a (8.4.7)*
105. *d (8.4.7)*
106. *a (8.4.7)*
107. *b (8.4.7)*
108. *c (8.4.8)*
109. *b (8.4.8)*
110. *c (8.4.9)*
111. *a (8.5)*
112. *a (8.5)*
113. *c (8.5)*

Section 9

1. *c (9.1)*
2. *a (9.1)*
3. *d (9.1)*
4. *b (9.2.1)*
5. *b (9.2.1)*
6. *a (9.2.1)*
7. *c (9.2.1)*
8. *c (9.2.2)*
9. *b (9.2.3)*
10. *c (9.2.3)*
11. *c (9.2.3)*
12. *a (9.2.3)*
13. *b (9.2.6)*
14. *c (9.2.7.1)*
15. *b (9.3.1.1)*
16. *c (9.3.1.2)*
17. *d (9.3.2)*
18. *a (9.3.2)*
19. *c (9.3.2)*
20. *b (9.3.3)*
21. *b (9.3.3)*
22. *a (9.3.3)*
23. *a (9.3.3)*

Section 10

1. *d (10.2.1)*
2. *d (10.2.2)*
3. *c (10.2.2)*
4. *a (10.2.2)*
5. *b (10.2.2)*
6. *c (10.2.3)*
7. *a (10.2.4.1.a)*
8. *b (10.2.4.1.b)*

Section 11

1. *b (11.2)*
2. *c (11.2)*

Annex A

1. *d (A.1)*
2. *b (A.1)*
3. *c (A.1)*
4. *b (A.2)*
5. *a (A.2)*
6. *c (A.2)*
7. *b (A.3)*
8. *a (A.4)*
9. *d (A.5)*

Annex C

1. *c (C.1.1)*
2. *d (C.1.2)*

3. c *(C.2.1)*
4. a *(C.2.5)*
5. c *(C.2.10 & C.3.3)*
6. d *(C.2.11)*
7. d *(C.2.12)*
8. c *(C.3.1 & C.3.2)*
9. a *(C.3.1)*
10. c *(C.3.2)*
11. b *(C.3.3)*
12. d *(C.4.3)*
13. a *(C.4.4)*
14. b *(C.4.4)*
15. b *(C.4.5)*
16. b *(C.4.7)*
17. c *(C.4.7)*
18. c *(C.4.9.c)*
19. d *(C.4.9.d)*
20. c *(C.4.9.e)*
21. a *(C.5.1.1)*
22. b *(C.5.1.2)*
23. c *(C.5.1.2)*
24. b *(C.5.1.3)*
25. a *(C.5.1.4)*
26. c *(C.5.2.2)*
27. d *(C.5.2.2)*
28. c *(C.5.2.3)*
29. b *(C.5.2.3)*
30. b *(Table C.1)*
31. c *(Table C.1)*
32. e *(Table C.1)*
33. e *(C.5.3.3)*
34. a *(C.5.3.5)*

Section 7

#5 Time Period = 2016-10/12 – 2012-4/12 = 2016.83 – 2012.33 = 4.5 yrs
Corr Rate = Metal Lost / Time = (588 – 570) / 4.5 = 18 / 4.5 = 4 mpy (or 0.004 ipy)

#6 **Calculate Long Term Corrosion Rate:**

Time Period = 2016-11/12 – 2003-6/12 = 2016.92 – 2003.5 = 13.42 yrs
Corr Rate = Metal Lost / Time = (422 – 368) / 13.42 = 54 / 13.42 = 4 mpy (or 0.004 ipy)

Calculate Short Term Corrosion Rate:

Time Period = 2016-11/12 – 2012-6/12 = 2016.92 – 2012.5 = 4.42 yrs
Corr Rate = Metal Lost / Time = (395 – 368) / 4.42 = 27 / 4.42 = 6.1 mpy (or 0.0061 ipy)

Select Controlling Corrosion Rate:

Larger of Long or Short = 6.1 mpy

Calculate Remaining Life:

Life = Remain Corr Allowance / Rate = (368 – 344) / 6.1 = 3.94 yrs Round up to 4 yrs

SDG