

Questions and Answers

Levels I, II, and III

Bubble Leak Testing

Supplement to
Recommended Practice
No. SNT-TC-1A
Book HB



**The American Society
for Nondestructive Testing, Inc.**

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Recommended Training References

Bubble Leak Testing Method

The following references were used in formulating the questions contained in this book.

- A.* McMaster, R.C., ed. *Nondestructive Testing Handbook*, second edition: Volume 1, *Leak Testing*, The American Society for Nondestructive Testing, Inc., Columbus, OH: 1982.
- B.* Jackson, Charles N., Jr., and Charles N. Sherlock, technical editors, Patrick O. Moore, editor, *Nondestructive Testing Handbook*, third edition, Volume 1, *Leak Testing*, The American Society for Nondestructive Testing, Inc., Columbus, OH: 1998.
- C.* *ASM Metals Handbook*, ninth edition, *Nondestructive Evaluation and Quality Control*, Volume 17, ASM International, Metals Park, OH: 1989.
- D.* *Annual Book of ASTM Standards*, Volume 03.03, Nondestructive Testing. "Standard Test Method for Leaks Using Bubble Emission Techniques," Standard E 515, American Society for Testing and Materials, Philadelphia, PA.

* Available from The American Society for Nondestructive Testing, Inc.

Each question found in this book is followed by letter(s) and page number(s) indicating the specific recommended reference where the answer may be found. For example:

17. Which of the following factors can most affect the sensitivity attainable by a pressure bubble leak test.

 - a. Operator alertness and technique.
 - b. Size and shape of test specimen.
 - c. Time and day testing is done.
 - d. Number of test technicians.

A.393

In this example, the letter "A" refers to Reference A in the list above and "393" is the page in that edition of Reference A where the answer to the question is located.

Reference Usage List

Reference A: Total = 118

Level I (42)

Level II (41)

Level III (35)

Reference B: Total = 10

Level I (5)

Level II (3)

Level III (2)

Reference C: Total = 3

Level I (1)

Level II (1)

Level III (1)

Reference D: Total = 0

Level I (0)

Level II (0)

Level III (0)

Level I Questions

Bubble Leak Testing Method

1. Which type of evacuation equipment is one of the two most widely used for vacuum box bubble leak testing?
 - a. Diffusion pump.
 - b. Mercury vapor pump.
 - c. Helium vapor pump.
 - d. Air ejector.

A.425
B.308
2. Before performing a vacuum box bubble leak test, which of the following should be checked for required calibration?
 - a. Leak detector solution.
 - b. Evacuation device or equipment.
 - c. Lighting equipment.
 - d. Pressure (or vacuum) gage.

A.425
B.308
3. Describe how a nonleaking visible surface fold or crevice, slag inclusion or porosity could appear as a false (virtual) leak indication during a vacuum box bubble leak test.
 - a. No bubbles would be apparent.
 - b. Short burst of bubbles lasting just a few seconds.
 - c. One large bubble every 10 s.
 - d. None of the above.

A.391
4. What is the usual minimum test observation time for a bubble leak test?
 - a. As fast as possible.
 - b. At least 0.17 h.
 - c. No more than 3 s.
 - d. As required by the test specification or procedure.

A.409
5. Which of the following is the basic type of true defect that would be indicated during a bubble leak test by a continuous flow of bubbles?
 - a. A hole or crack through the test boundary.
 - b. Slag inclusion in center of weld.
 - c. Extended area of surface defects or cracks.
 - d. Lack of fusion at root of weld.

A.400, 423
B.260
C.57
6. Which of the following is the wrong method of applying the leak testing bubble solution to the test surface?
 - a. Apply by flowing on the surface.
 - b. Brush evenly on the test area.
 - c. Apply to test the surface with a fine orifice spray.
 - d. None of the above.

A.389, 417, 420, 427-428
7. How soon should the vacuum box be applied to the test surface after application of the bubble solution?
 - a. Allow time for test pressure to reach equilibrium.
 - b. 0.5 h.
 - c. Within 60 s or as required by the procedure.
 - d. None of the above.

A.425
8. What is the best procedure to follow if too much time has passed and the bubble solution has dried before applying the vacuum box to the test specimen?
 - a. Consider that area tested and move on to the next test area.
 - b. Clean the test area, reapply the solution and then test.
 - c. Increase test pressure.
 - d. Add a fluorescent dye to the solution, reapply and test.

A.427

Bubble Leak Testing Method, Level I

9. What is the first thing to be done to the test area before performing any bubble leak test?
- Clean and visually test the test area.
 - Cool the test specimen to -1°C (30°F).
 - All of the above.
 - None of the above.
- A.394, 425
10. What procedure should be followed in order to vacuum box bubble leak a corner weld?
- It is only necessary to visually test a corner weld.
 - Double the test pressure.
 - Use some other nondestructive testing method for corner welds.
 - Use a special vacuum box that fits the geometry of the test area.
- A.423-424
11. What is the surest means to prevent the failure (implosion) of a vacuum box caused by the pressure differential created by the evacuation of the box?
- Build the box to withstand a full atmosphere (101 kPa or 14.7 psi) of pressure differential.
 - Monitor the pressure differential with a vacuum gage installed inside the box.
 - Watch the bubble solution become fluorescent, indicating that a pressure difference of 102 kPa (29.9 in. Hg) has been reached.
 - It is not possible to evacuate the box enough to reach a pressure differential high enough to cause failure.
- A.423
12. What may happen if the maximum allowed (design) pressure for the specimen is exceeded when pressurizing for a bubble leak test?
- The test specimen may rupture or explode.
 - The solution may explode.
 - A false leak indication may show.
 - No unusual indication will occur.
- A.175-176
13. Which of the following best describes how an indication of a very large or gross leak would appear in a vacuum box?
- Large leaks will not show with this test.
 - A large bubble or bubbles may form briefly or the solution may be blown away immediately.
 - A continuous series of bubbles would always appear.
 - None of the above.
- A.429
14. Which of the following best describes how an indication of a very small leak would appear when bubble leak testing?
- A continuous appearance of several to many small bubbles at regular intervals or one large bubble that grows slowly.
 - Small leaks of this nature will not be indicated by this test.
 - A single small bubble would form.
 - None of the above.
- A.396
15. What surface condition can interfere with the detection of real leakage bubbles or produce a spurious or false indication of leakage?
- Coating the surface with leak detector solution after thorough cleaning.
 - Testing with surface temperature of test specimen at 70°C (184°F).
 - Air trapped in surface defects or grease or dirt.
 - Highly polished test surface.
- A.390-391, 394
16. What parameter can directly affect the sensitivity of any vacuum box bubble leak test? *Sensitivity* is the smallest size leakage that may be detected by this leak test technique.
- Ambient air dew point temperature is more than -4°C (25°F).
 - Slight residual magnetism in test specimen.
 - Amount of pressure differential created with the box.
 - Test specimen size.
- A.392-393, 427, 429
17. Which of the following factors can most affect the sensitivity attainable by a pressure bubble leak test?
- Operator alertness and technique.
 - Size and shape of test specimen.
 - Time of day testing is done.
 - Number of test technicians.
- A.393
18. Which type of leaking discontinuity is most likely to go undetected during a pressure bubble leak test?
- A discontinuity (such as a crack) that shows up well on a radiograph.
 - A very small leak or a very large leak.
 - A defect in a mechanically rolled joint.
 - A defect in a welded joint.
- A.396, 427, 429

Bubble Leak Testing Method, Level I

19. When a pipe is blanked for pressurizing using an expandable stopper or plumber's type plug inside the line, what should be done to prevent blowout of the plug?
- Reduce pressure to a safe level.
 - Install a stop bar to prevent blowout of the plug.
 - Test at night when the plant or site is unoccupied.
 - None of the above.
- A.433, Fig. 25
20. When performing a bubble leak test, the reason for periodically checking a leak detector solution against a known path leak would be to:
- determine the viscosity of the solution.
 - measure the size of the leak.
 - verify that the leak still existed.
 - verify that the solution functioned as required.
- A.397, 427
21. Which of the following is the reason a large or gross leak may go undetected during a bubble leak test?
- Vacuum box bubble testing will not enable the detection of large leaks.
 - Use of the wrong test equipment.
 - The bubble solution may be blown away before detectable bubbles can be seen.
 - Illumination by ultraviolet light shows no defect.
- A.396, 427
22. Which of the following is correct with respect to vacuum box bubble leak testing?
- Test sensitivity decreases with decrease in pressure differential.
 - The size and the frequency of the bubbles have no relationship to the leak size and character.
 - Bubble test solution is generally required to have a high specific gravity.
 - All of the above.
- A.393
23. For safe use without the need of a relief device, a vacuum box for bubble leak testing should be designed to permit sustained operation at a vacuum (pressure differential) of about:
- 30 in. Hg.
 - 15 psi.
 - 102 kPa.
 - all of the above.
- A.419, 423
24. A vacuum box for bubble testing should be equipped with:
- a transparent viewing window.
 - rapid evacuation equipment.
 - a pressure gage (if mounted inside) or a vacuum gage (if mounted outside), or a combination pressure/vacuum gage.
 - all of the above.
- A.423-424
25. Which of the following test materials may safely be used for immersion bubble leak testing provided they are not detrimental to the component being tested?
- Water with wetting agent.
 - Carbon tetrachloride.
 - Acetone.
 - Refrigerant 12.
 - All of the above.
- A.403-404
26. If static bubbles appear in the area of interest during a vacuum box bubble leak test:
- the test area should be cleaned and reexamined to determine if this is a spurious or false indication.
 - this should be reported as a leak.
 - the test area should be cleaned and reexamined at a lower pressure differential.
 - the area of interest should be considered free of leaks.
- A.428

Bubble Leak Testing Method, Level I

27. If a few small bubbles rapidly form in the area of interest during a vacuum box bubble test and then terminate almost immediately (in a few seconds):
- a. this is indicative of a real small sporadic leak.
 - b. this means the bubble solution is no good and as a result the test must be repeated.
 - c. this is indicative of either a false or virtual leak.
 - d. none of the above.
- A.390-391**
28. Which of the following is the reason that very small leaks go undetected during a bubble leak test?
- a. The barometric pressure is too low.
 - b. The vacuum box is too small.
 - c. The operator is observing the test area for too short a period of time.
 - d. The rubber gasket on the vacuum box is worn.
- A.390**
29. An area that has been bubble leak tested is considered to be free of leaks within the sensitivity of the test method when:
- a. the vacuum gage on the vacuum box reads 93 kPa (27.6 in. Hg).
 - b. there are no bubble indications of leakage observed.
 - c. there are no spurious or false leak indications.
 - d. the vacuum gage reading drops to 99 kPa (29.3 in. Hg) in 10 s.
- A.410, 428**
30. For bubble leak testing in an enclosed heated area, which of the following would be considered relevant?
- a. The ambient temperature drops to 20 °C (94 °F).
 - b. The formation of one or more small bubbles which do not repeat.
 - c. The vacuum or pressure dial gage reading.
 - d. Rainy and windy weather.
- A.420**
31. To be sure that all test areas are leak tested when vacuum box bubble testing, overlap successive settings of the vacuum box by at least:
- a. the depth of the rubber gasket.
 - b. 50% of the box length.
 - c. 51 mm (2 in.) or more.
 - d. no overlap is required.
- A.429
B.308**
32. When performing a bubble test to detect very small leaks, the leak detector solution should be applied to the test surface:
- a. in a light coating relatively free of bubbles.
 - b. without surface precleaning.
 - c. in a thick foam.
 - d. at least 300 s before observation of the solution.
- A.415, 419-420**
33. Acceptable methods of applying leak detector solution are:
- a. brushing.
 - b. spraying.
 - c. squirt bottle.
 - d. all of the above.
- A.420**
34. After a vacuum box is positioned, the operator should observe the leak detector solution as the box is first evacuated in order to:
- a. not overlook small leaks that tend to blow through the detector solution instead of forming visible bubbles.
 - b. check on the vacuum reading.
 - c. not overlook large or gross cracks that tend to blow the detector solution away.
 - d. none of the above.
- A.429**
35. A tag or sticker attached to the glass face or metal case of a pressure or vacuum dial gage used in bubble leak testing would normally show the:
- a. manufacturer's serial number and date of manufacture.
 - b. company property inventory number and date inventory due.
 - c. date calibrated, date calibration due and identity of calibrator.
 - d. job number, foreman's initials and date.
- A.201-211**

Bubble Leak Testing Method, Level I

36. Under normal procedures, how often should a vacuum or pressure dial gage be calibrated when in storage?
- Every 6 months.
 - Every 3 months.
 - It would not have to be calibrated when in storage.
 - None of the above.

A.425

37. What might happen if an uncalibrated, inaccurate dial gage was used for a vacuum box bubble leak test?
- The required test pressure may not be achieved.
 - The vacuum box gasket might stick to the test surface.
 - The transparent window would implode.
 - The vacuum box gasket would leak excessively.

A.423, 425

38. Soak time for a bubble leak test of a pressurized system is the term for the time that must elapse between:
- application and observation of the leak detector solution.
 - completion of pressurization and application of the leak detector solution.
 - mixing and applying the leak detector solution.
 - initial observation and final interpretation of leakage indications.

A.427

39. A 35 kPa (5 psig) pressure differential is required for a vacuum box bubble leak test. The vacuum box is equipped with an external vacuum gage graduated in inches of mercury. What approximate reading would have to be reached on the gage to meet the test requirements?
- 30.
 - 13.6.
 - 10.
 - 2.5.

A.192
B.28

40. The letters "psia" mean:

- pressure referred to National Bureau of Standards* absolute pressure.
- pascals per square inch absolute.
- pressure standard in absolute units.
- pounds per square inch absolute.

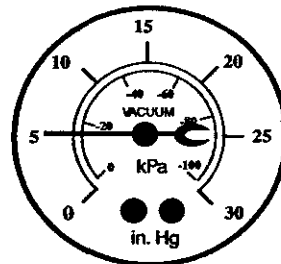
A.194, 799

41. The letters "psig" mean:

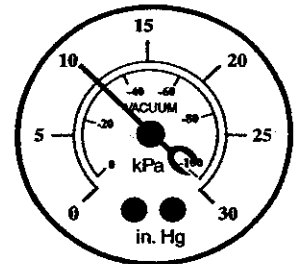
- pressure standard in gage units.
- pounds per square inch gage.
- pounds standard in grams.
- pressure per square inch.

A.193, 799

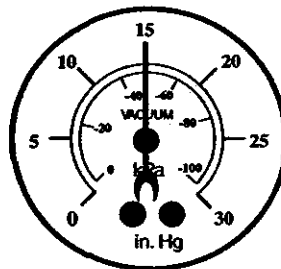
42. A vacuum box solution film test procedure requires that the test be performed at a pressure differential of at least 55 kPa (8 psig). Which of the following vacuum gages indicates a pressure differential that meets this procedure requirement?



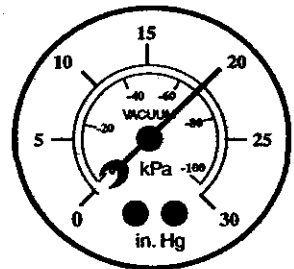
a. _____



b. _____



c. _____



d. _____

A.192, 343

* Now known as NIST (National Institute of Standards Technology)

