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Continuing Education Course #052
Introduction to Piping Engineering

1. The Goal of Piping Engineering can be defined as:
 - a. Successful performance of pipe stress analysis.
 - b. Assuring the installed pipe meets Code requirements.
 - c. Assuring Owner preferences are included whenever requested.
 - d. Assuring the pipe can perform reliably and safely in all expected conditions for its design life.

2. Which of the following statements are true?
 - a. Each piping system has potential failure modes.
 - b. Pipe has limitations in age and usage.
 - c. Pipe is manufactured and installed to very exacting tolerances.
 - d. Piping systems are subjected to limited and well defined loading conditions.
 - e. A & B only
 - f. A & C only

3. If you are working with a piping system in a power plant, the applicable ASME code(s) is most likely:
 - a. ASME B31.1
 - b. ASME B31.3
 - c. ASME B31.5
 - d. ASME B31.8

4. The following statement best defines the ASME piping codes:
 - a. Provides guidelines and minimum standards
 - b. Provides detailed procedures for all analysis
 - c. Provides detailed procedures for long term maintenance and inspection of piping systems
 - d. Provides all the information required to perform piping engineering.

5. Which of the following statements is false?
 - a. The design conditions for the equipment must be coordinated with the design conditions of the piping system.
 - b. Equipment nozzles may move due to thermal growth from ambient to operating condition.
 - c. Equipment nozzles are as strong as the pipe, and rarely are loads on equipment a concern
 - d. Piping supplied with the equipment should be considered as part of the piping system.

6. Pipe material temperature limits are almost always the same as a piping system engineering design condition.
 - a. True
 - b. False

7. A reasonable "Rule of thumb" for water velocity in a pipe is:
 - a. 15 feet per second
 - b. 30 feet per second

- c. 50 feet per second
- d. 100 feet per second

8. In selecting materials for high temperature service some of the considerations could be:

- a. Creep
- b. Hydrogen embrittlement
- c. Seamless or seam welded construction
- d. All of the above

9. Which of the following phenomena can create local failure in an otherwise satisfactory piping system?

- a. Vortex shedding
- b. Dissimilar metal welds
- c. Accelerated flow through closely spaced elbows, branches and reducers
- d. All of the above

NOTE: The following question was revised on 25 June 2018

10. Which best describes the limits of a piping system for evaluation?

- a. Pipe from contractual limit to contractual limit
- b. Pipe, pipe supports and significant branch pipes from contractual limit to contractual limit
- c. Pipe from equipment nozzle to equipment nozzle
- d. Pipe, pipe supports and significant branch pipes from equipment nozzle to contractual limit
- e. Pipe and significant branch pipes from equipment nozzle to equipment nozzle
- f. Pipe, pipe supports and significant branch pipes from equipment nozzle to equipment nozzle

11. When deciding if a branch line should be included as part of the system, the following rule usually applies

- a. The branch pipe outside diameter is less than half the header diameter
- b. The ratio of the header to branch pipe section modulus is less than 7.
- c. The branch pipe is rigidly supported within 7 pipe diameters of the header.
- d. The branch pipe flow is usually valved off.

12. The hoop stress is:

- a. About the same as the longitudinal pressure stress
- b. About two times the longitudinal pressure stress
- c. About four times the longitudinal pressure stress
- d. About ten times the longitudinal pressure stress

13. If an unrestrained pipe is 100 feet long and heated from ambient to 800F, the pipe should

- a. Lengthen about 10"
- b. Lengthen about 7"
- c. Lengthen about 3"
- d. Shorten about 8"

14. The first choice for absorbing thermal movement in a piping system should be:

- a. Add expansion joints
- b. Use cold spring
- c. Restrain the pipe rigidly to keep it from moving
- d. Let the pipe and elbows flex to absorb the movement.

15. Expansion joints require

- a. Guides on the pipe to assure there is not excessive rotation
- b. Tie rods or pipe anchors if the longitudinal pressure force exceeds the expansion joint allowable
- c. Periodic inspection and possibly replacement
- d. All of the above

NOTE: The following question was revised on 25 June 2018

16. Pipe support spacing tables from the internet

- a. Are always conservative and can be used for locating pipe supports.
- b. Are dangerous to trust because the basis of the calculations is not known
- c. Do not need to be modified for valves and elbows
- d. Do not need to be modified for branch connections

17. A calculated pipe support load of 0 lbs or less means

- a. The support may not be needed
- b. The support type may need to be modified
- c. The support spacing may need to be modified
- d. All of the above

18. Safety Valve thrust forces can

- a. Over stress a standard header nozzle connection
- b. Damage the pipe header by excessive deflection
- c. Create a requirement for special header supports
- d. All of the above

19. Criteria for determining if a piping system should be analyzed for a seismic event include:

- a. Seismic zone
- b. Contents of pipe
- c. Owner plans for operation through, or re-start after a seismic event
- d. All of the above

20. Steam hammer is a major dynamic event created by

- a. Flashing water to steam
- b. Flow pulsations created during normal operation
- c. Fast acting valves
- d. Safety valve thrust

21. Water hammer is a major dynamic event that

- a. Must be avoided by proper design and operation of drains
- b. Should be restrained by rigid supports
- c. Can be analyzed with hand calculations in ASME B31.1
- d. Produces loads similar in magnitude to wind loads

22. A pipe support whose support load varies with displacement is a

- a. Rigid rod hanger
- b. Variable spring hanger
- c. Hydraulic snubber
- d. Constant support hanger

23. A pipe support that restrains all three orthogonal movements and all three orthogonal rotations is a

- a. Sway strut
- b. Rigid stanchion with axial restraint and lateral guide
- c. Rigid rod hanger with guide
- d. Anchor

24. Travel stops

- a. Are installed by vendors to preset the specified ambient condition displacement
- b. Must be removed prior to operation
- c. Should be saved for later use
- d. All of the above

25. Pipe analysis calculations are very accurate compared to the installed pipe actual pipe stresses and movements.

- a. True
- b. False

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