



**UNIVERSITI KUALA LUMPUR
MALAYSIA FRANCE INSTITUTE**

**FINAL EXAMINATION
SEPTEMBER 2013 SESSION**

SUBJECT CODE : FFD 22602
SUBJECT TITLE : BASIC PRESSURE VESSEL DESIGN
LEVEL : DIPLOMA
TIME/DURATION : 2.0 HOURS
DATE :

INSTRUCTIONS TO CANDIDATES

- 1. Please read the instructions given in the question paper CAREFULLY.**
 - 2. This question paper is printed on both sides of the paper.**
 - 3. Please write your answers on the answer booklet provided.**
 - 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.**
 - 5. This question paper consists of TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer TWO (2) question only.**
 - 6. Answer all questions in English.**
 - 7. No graph paper is appended.**
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THERE ARE 6 PRINTED PAGES OF QUESTIONS, AND NO PAGE OF GRAPH PAPER EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.**

1. Sandblasting is the act of propelling very fine bits of material at high-velocity to clean or etch a surface. Is it true or false?

(2 marks)

2. The Manufacturer Data Report must be fully and correctly completed, as well as record retention of complete vessel material and fabrication records. Is it true or false?

(2 marks)

3. The aerated water in the plastic bottle is also considered as a pressure vessel? Is it true or false?

(2 marks)

4. The desired life time of an economical design of the major vessels are usually designed for operating life time between 15 – 25 years. Is it true or false?

(2 marks)

5. Tell-tale hole is drilled in the Reinforcement Pad to release entrapped hot air or hot gas. Is it true or false?

(2 marks)

6. Pressure vessels function as a useful *energy source*. Is it true or false?

(2 marks)

7. The manhole / manway for a pressure vessel are to allow the smooth flow of its content. Is it true or false?

(2 marks)

8. The diagrams show a vacuum breaker and a pressure relief valve. Describe a function of both. What will be the result if the devices do not function?

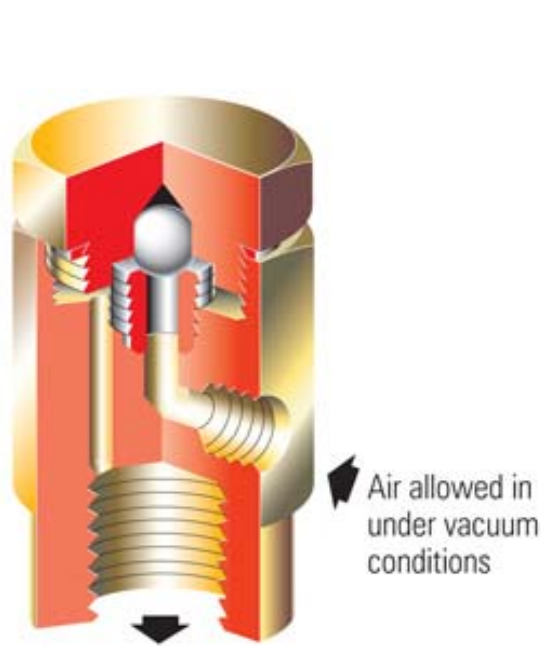


Figure 2 A Vacuum Breaker

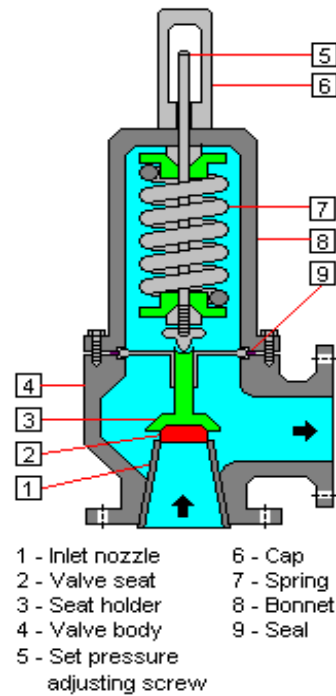


Figure 1 A Pressure Relief Valve

(5 marks)

9. Before a pressure vessel is painted, what are the surface preparations and the care to be taken?

(5 marks)

10. How many saddles are usually used in a horizontal pressure vessel? Write one main reason for the use of wear plates in saddles

(6 marks)

11. What is the purpose of performing a hydrostatic test? What would normally be filled inside the pressure vessel? State the minimum duration to perform it.

(6 marks)

12. The figure 3 shows a vertical tall tower. What type of stresses is the vertical tower experiencing if a wind loading passes it? Assuming that the height of the tower is 75 ft., what is the maximum deflection? Take 6 inches per 100 ft. for maximum deflection.

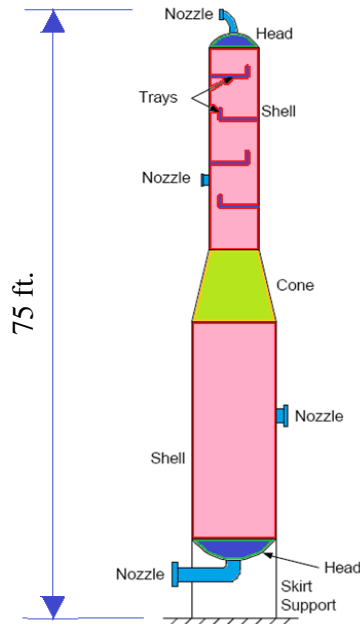


Figure 3 A Vertical Tall Tower

(6 marks)

13. Find the optimum vessel diameter and length with the given design data with pressure is limited to 1000 psi and ellipsoidal heads are assumed. The design pressure is 215 psi, volume is 1000 cu. ft., stress value of metal is 16000 psi, the joint efficiency is 0.85, and the corrosion allowance is 0.0625 inches.

(6 marks)

14. The weight of the vessel when dry is 7890 kg. The weight of the water filled in for hydrostatic test is 22220 kg. Find the total weight of the vessel for hydrostatic test.

(6 marks)

15. From question 14, assuming that item 1 to item 11 is 2/3 of 7890 kg.; find 6% for overweight of plates and welding.

(6 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.

Please use the answer booklet provided.

Question 1

- a) List down any FOUR (4) loadings of ASME Section VIII, Div.1 - UG-22.

Explain any one type of the loading.

(5 marks)

- b) From the diagram below calculate l , if $y = 17.5\text{mm}$. If the thinner plate is 12.0mm, what is the thickness of the thicker plate? *Convert your answer to inches. Take $25.4\text{mm} = 1\text{ inch}$*

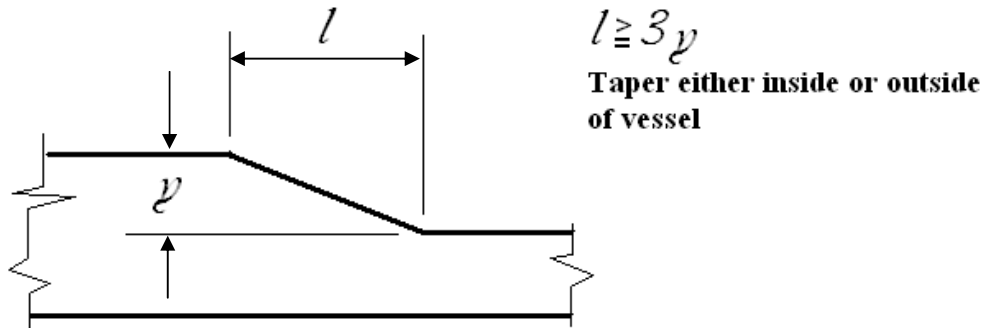


Figure 4 The thicker plate will be tapered as per the design requirement.

(7 marks)

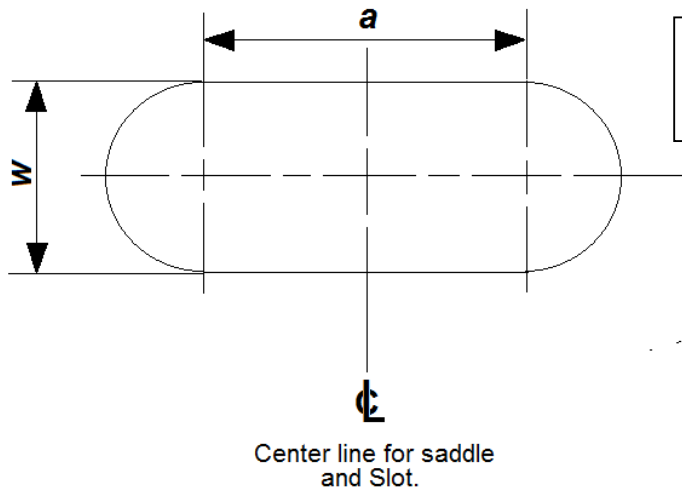
- c) The height of tall towers depends greatly on its functions. To erect a tower, loadings such as wind and earthquakes are also considered. Write and illustrate with a simple schematic the reason why with different height stages, different plate thicknesses are utilized.

(8 marks)

Question 2

When heat is induced into a pressure vessel, then it will expand and the pressure will also increase. Due to this, a horizontal vessel supported by two saddles and one is allowed to move. The anchor bolt slots will be used instead of holes. Based on this information;

- a) Find the minimum length dimension **a** of the slot base on the given data, and width **w**.



1. Distance between saddles = 70 ft.
2. Temperature = 600 °F
3. Diameter of Anchor bolt = ¾ inches

The width of the slot equals the diameter of the anchor bolt plus $\frac{1}{4}$ inches. (8 marks)

- b) State **TWO (2)** reasons for the use of wear plate. (6 marks)
- c) Why must the anchor bolt nut be tightened by hand and secured by tack weld? (6 marks)

Question 3

- a) The installations of pressure relief devices or safety valves are a must in terms of design considerations.
- i) State the differences between explosion and implosion.

- ii) The function of both pressure relief valve and vacuum breaker is to ensure the right pressure inside the vessel. How much difference is the design pressure to the maximum allowable operating pressure?

(10 marks)

- b) In terms of horizontal vessels;

i) In which conditions stiffener ring will be used?

ii) Where should the stiffener rings be located?

(10 marks)

Question 4

- a) Compare the different usage of a vortex breaker to a downpipe.

(6 marks)

- b) How stairways should be fabricated for shipping or field erection purposes?

(6 marks)

- c) Write down the fabrication methods for the above purposes.

(8 marks)

END OF QUESTION