



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2014 SESSION

SUBJECT CODE	:	FFD22602
SUBJECT TITLE	:	BASIC PRESSURE VESSEL DESIGN
LEVEL	:	DIPLOMA
TIME/DURATION	:	9.00 AM – 11.00 AM (2.0 HOURS)
DATE	:	9 JANUARY 2015

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
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THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)**INSTRUCTION: Answer ALL questions.**

Please use the answer booklet provided. For question 1 to 7, tick down correct answer.

Question 1 to 7	Yes	No	Marks
1. Sandblasting is the act of propelling very fine bits of material at high-velocity to clean or etch a surface.			2
2. The Manufacturer Data Report must be fully and correctly completed, as well as record retention of complete vessel material and fabrication records.			2
3. The aerated water in the plastic bottle is also considered as a pressure vessel?			2
4. The desired life time of an economical design of the major vessels are usually designed for operating life time between 10 – 25 years.			2
5. Tell-tale hole is drilled in the Reinforcement Pad to release entrapped hot air or hot gas.			2
6. Pressure vessels function as a useful <i>energy source</i> .			2
7. The manhole / manway for a pressure vessel are to allow the smooth flow of its content.			2

8. 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. (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. The diagrams show a vacuum breaker and a pressure relief valve. Describe a function of both. (6 marks)

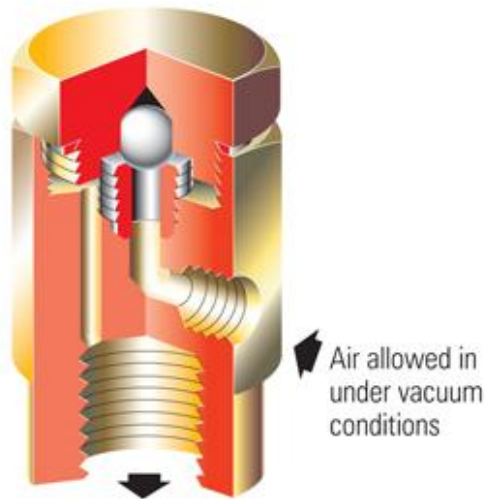


Figure 1 A Vacuum Breaker

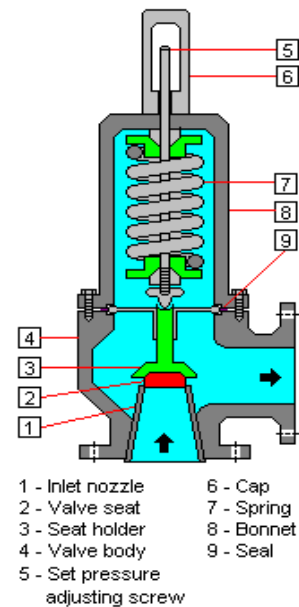
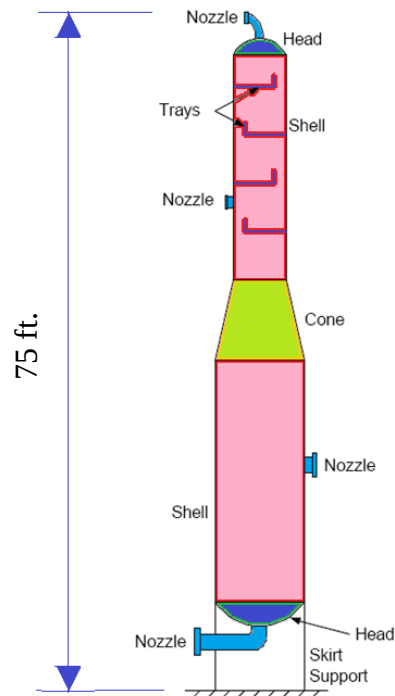


Figure 2 A Pressure Relief Valve

12. The design pressure of a vessel is 125 psi and the weight of the vessel when dry is 7890 kg. When filled with water for hydrostatic test it is 22220 kg. Find the total weight of the vessel for hydrostatic test and what would the hydrostatic test will be? (6marks)

13. The figure 3 shows a vertical tall tower. Assuming that the height of the tower is 75 ft., what is the maximum deflection? Take 6 inches per 100 ft. for maximum deflection. (6 marks)

Figure 3 A Vertical Tall Tower



14. 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, vessel volume is 1200 cu. ft., stress value of metal is 16000 psi, the joint efficiency is 0.85, and the corrosion allowance is 0.0625 inches. (*Refer to Table 2 provided, see page 6*). (6 marks)
15. How to interpret SA 515 Grade 70 @ 500⁰F from the design data? (6 marks)

SECTION B (Total: 40 marks)**INSTRUCTION: Answer TWO (2) questions only.****Please use the answer booklet provided.****Question 1**

- a) i) From the figure 4, calculate l , if $\psi = 17.5\text{mm}$.
 ii) If the thinner plate is 12.0mm, what is the thickness of the thicker plate?
 Convert your answer to inches. Take $25.4\text{mm} = 1\text{ inch}$ (8 marks)

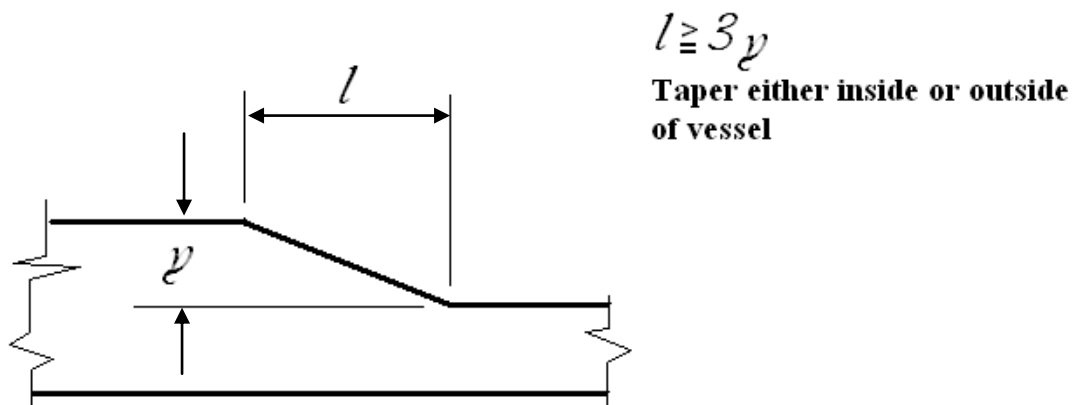


Figure 4 The thicker plate will be tapered as per the design requirement.

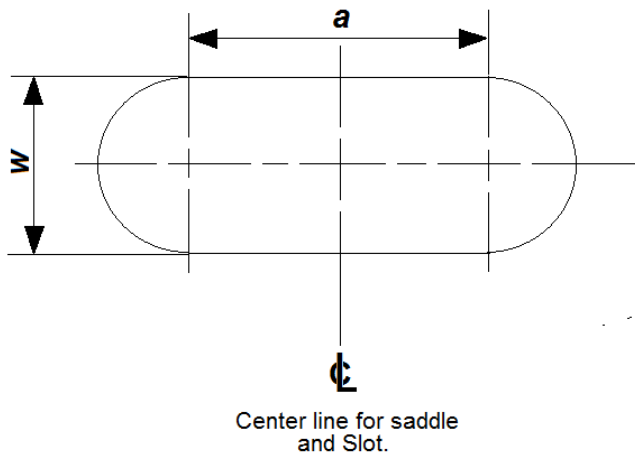
- b) The height of tall towers depends greatly on its functions. To erect a tower, loadings such as wind and earthquakes are also considered (UG-22). Write and draw a simple schematic the windward wind and leeward wind and explain the **TWO (2)** types stresses that the tall tower will experienced.

(12 marks)

Question 2

When pressure and heat is induced into a pressure vessel, then it will expand. Due to this, a horizontal vessel supported by two saddles; one saddle is allowed to slight. 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**, in table 1. (8 marks)



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

1. Distance between saddles = 70 ft.
2. Temperature = 600°F
3. Diameter of anchor bolt = $\frac{3}{4}$ inches

- 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)

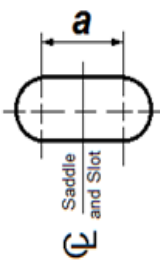
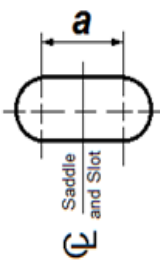
Minimum Length of Slot (Dimension "a")											
	Distance between Saddles (Ft.)	For Temperature °F									
		-50	100	200	300	400	500	600	700	800	900
	10	0	0	0	1/4	3/8	3/8	1/2	5/8	3/4	3/4
	20	0	0	1/4	3/8	5/8	3/4	1	1 1/8	1 1/4	1 3/8
	30	1/4	1/8	3/8	5/8	7/8	1 1/8	1 3/8	1 5/8	1 5/8	2
	40	3/8	1/8	3/8	3/4	1 1/8	1 1/2	1 7/8	2 1/8	2 3/8	2 1/2
The width of the slot equals the diameter of anchor bolt + 1/4"	50	3/8	1/4	1/2	1	1 3/8	1 5/8	2 1/4	2 5/8	3	3 3/8
	60	3/8	1/4	5/8	1 1/4	1 5/8	2 1/8	2 3/4	3 1/8	3 5/8	4 1/8
	70	1/2	1/4	3/4	1 3/8	1 7/8	2 1/2	3 1/8	3 5/8	4 1/4	4 5/8
	80	1/2	3/8	3/4	1 1/2	2 1/8	2 7/8	3 5/8	4 1/4	4 7/8	5 3/8
	90	5/8	3/8	7/8	1 3/4	2 3/8	3 1/4	4	4 5/8	5 3/8	6
	100	5/8	3/8	1	1 7/8	2 5/8	3 5/8	4 1/2	5 1/8	6	6 5/8

Table 1 Slot length table

Question 3

- a) Explain the function and location of a vortex breaker to a horizontal pressure vessel. (6 marks)
- b) Where would the recommended location to fix the nameplate? Briefly explain what information that must be stamped to a nameplate. (6 marks)
- c) What is a telltale hole; state its function and location. (8 marks)

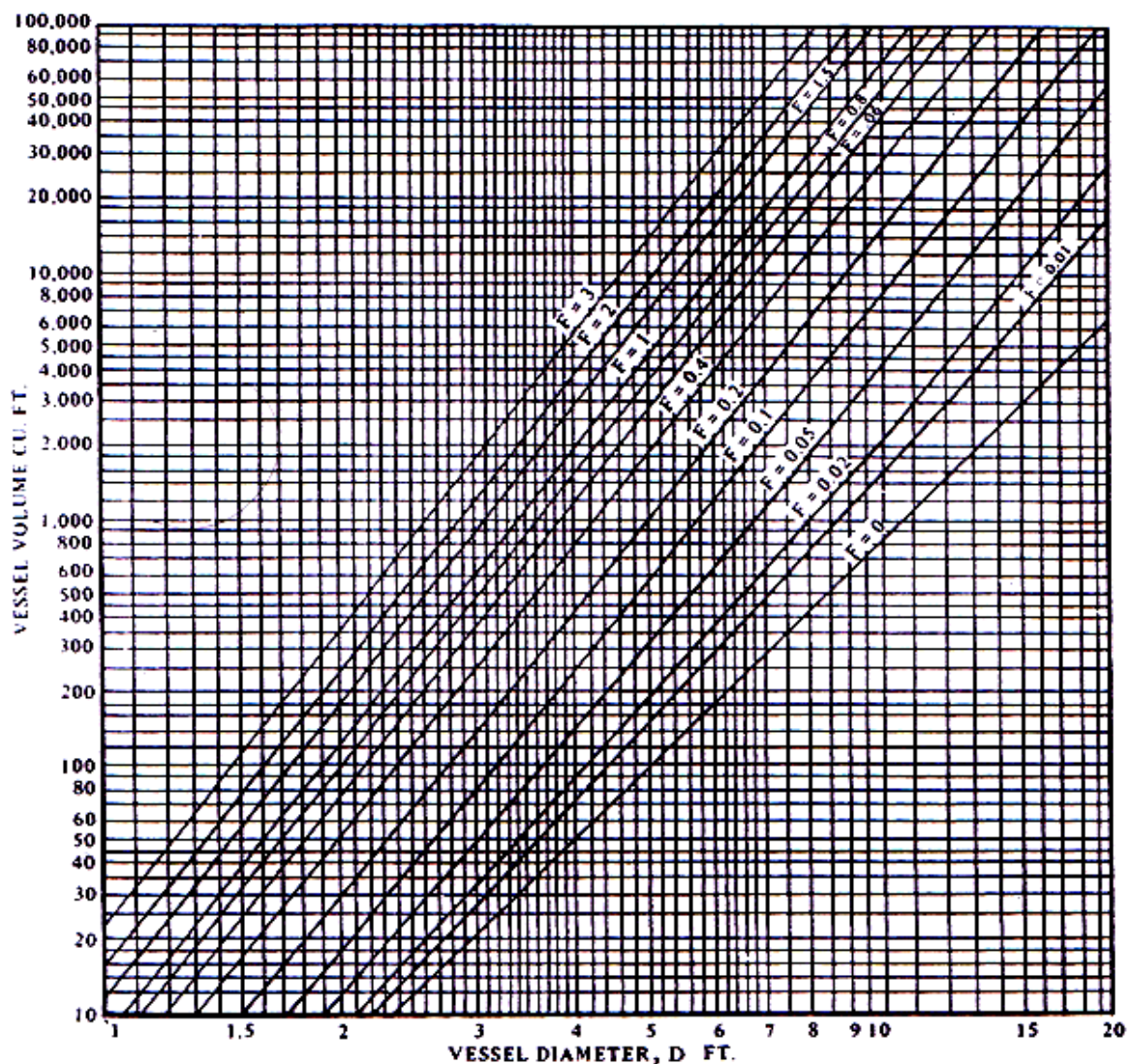


Table 2 Chart for determining the optimum pressure vessel size

END OF QUESTION