

**MEC 722**  
**Thermal System Design**  
**Individual Assignment #2**

**Due date: October 26, 2015 by 4:00PM**

You have been asked to provide a proposal to supply a process fluid storage tank with the following specifications:

Tank volume:	5000 US Gal
Design pressure:	400 PSIG
Design temperature:	650 Deg F
Corrosion allowance:	1/8"
Inlet connection:	4"-600# Flanged, 6" high, locate on top of tank at centre
Outlet connection:	6"-600# Flanged, 6" high, locate on bottom at centre

In order to be able to compare designs, please use the following standards:

- 1) Shell and heads to be made from SA 516 Gr 60 steel.
- 2) Heads are seamless. Shell is rolled plate with a longitudinal weld.
- 3) Pipe for nozzles to be SA 106 Gr B steel (seamless)
- 4) Use the following costs:
  - a. Steel: SA 516 Gr 60 @ \$1.80/lb
  - b. 4" Pipe for nozzles: 4" Sch 80 \$36/ft, 4" Sch 40 \$30/ft
  - c. 6" pipe for nozzles: 6" Sch 80 \$65/ft, 6" Sch 40 \$50/ft
  - d. 4" Flange \$90, 6" flange \$170
  - e. Welds cost \$50.00t<sup>2</sup>/inch where t = metal thickness for butt welds (circumferential and longitudinal shell joints) or t = leg height for fillet welds (nozzle to shell joint)
  - f. Radiography, if used, costs \$500 + \$50/ft of weld (full radiography) or \$500 + \$10/ft (spot radiography).
- 5) All design calculations must be in accordance with the ASME Pressure Vessel Code.

The total cost of the tank will be the sum of material cost, welding cost (welding cost includes labour) and radiography cost (if used). Note that the above costs are not necessarily correct. They are used to provide a uniform cost basis for all students.

Your proposal should consist of the following:

- 1) Letter of offer that includes a description of the tank including all pertinent dimensions and weight. See the attached sample letter (use your own words/format)

- 2) Assembly drawing of the tank including material thicknesses and welding symbols for all welded joints including the nozzle-to-shell joint, longitudinal and circumferential shell joints and flange-to-nozzle joints
- 3) A bill of materials
- 4) An appendix including all design calculations

**Note:** It is not necessary to optimize your design. Part of the point of this assignment is to compile all results and compare the different designs. You will find material allowable stress specifications on the course web site.

## **Sample Letter of Offer**

Ryerson University  
350 Victoria Street  
Toronto, Ontario  
M5B 2K3

November 1, 2010

Re: Storage Tank

Dear Sir/Madam,

Thank you for allowing us the opportunity to quote on this project. As you know. Tanks R Us is one of the smallest and least talented tank design and manufacturing facilities in the country. Our customer base is small but loyal, and shrinking fast.

Further to your request, we are pleased to offer our quotation for one 600 ft<sup>3</sup> storage tank, rated for 300 PSIG at 750 Deg F. The tank will be approximately 80" diameter x 20'-6" long, fabricated from SA 516 Grade 70 steel in defiance of the ASME Pressure Vessel Code. The vessel will weigh (empty) approximately 17,200 lbs. The total cost for this vessel is \$15,410. Delivery will be 6 weeks after receipt of order. This quotation is valid for 30 days.

Terms and conditions are attached.

We trust this proposal meets with your approval. If you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

Jacob Friedman  
Tanks R Us Ltd.