Assignment 1

Problem 1: In a process to separate and purify propane from a mixture of propane and heavier straight-chain saturated hydrocarbons (e.g. n-butane, n-pentane etc.), the feed stream is fed to the 18th tray of a 24-tray distillation column. The overhead vapor stream from the column is totally condensed in a water-cooled heat exchanger prior to being fed to an overhead reflux drum. The liquid product from the drum is sent to the reflux pump (which has a spare), and the discharge from the pump is split into two streams. One of these streams is the overhead reflux to the column and is fed back to the column on Tray 1. The second liquid stream from the pump discharge is the overhead product and is sent to storage.

The bottom of the distillation column is used to store the liquid leaving the bottom plate. From the bottom of the column a liquid stream leaves and is immediately split into two. One stream is the bottom product, which is sent for further processing in Unit 400. The other stream is sent to a thermosyphon reboiler where a portion of the stream is vaporized by condensing low pressure steam on the other side of the exchanger. The partially vaporized stream from the reboiler is returned to the column just below the twenty-fourth tray. The two-phase mixture separates, with the vapor portion passing upward through the bottom plate to provide the vapor flow in the column. The liquid portion returns to the liquid accumulated at the bottom of the column.

For the process described above, draw a process flow diagram by hand as well as by using CHEMCAD.

Problem 2: Please see Figure 1.5 (page 30-31) of the text-book and answer the following questions:

1. In the approval/date block, what does "HDA" stand for?
2. In the approval/date block, what is the company "TBWS Designs"?
3. How is the operation of V-103 like opening a bottle of Coca-Cola?
4. What is the value of the reflux ratio of T-101?

Problem 3: Please see Figure P1.9 (page 53) of the text-book. Find at least six errors in it. All errors are in items actually shown on the drawing. Do not cite "errors of omission" ("such and such not shown"), as this is only a portion of the P & ID.