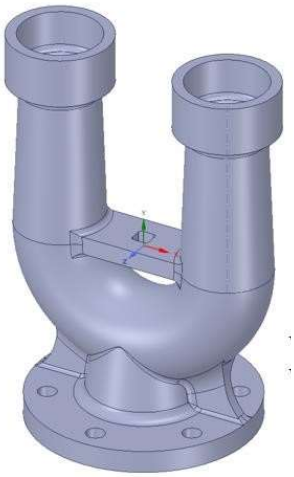
Assignment 3 – Linear Elastic Stress Analysis of a Valve Part

The goal of this assignment is to determine with *high accuracy the location of and value of peak stress in the valve body* shown in Figure 1. The valve is made of Structural Steel found in the Engineering Data tool. The primary load is internal cyclic internal pressure. The cyclic nature of the load means that fatigue failure is a possibility. Hence, the determination of the peak stress is important to ensure the structural integrity of this part. 50 points for each part.



Valve.scdoc

Figure 1

Part A – Determine the peak equivalent stress with high accuracy*; that is within +/- 1MPa*. As shown in Figure 2, impose a frictionless support on the bottom surface. All internal surfaces are subject to an internal pressure of 50 MPa. For the purposes of this assignment ignore end effects at the pipe ends. Also, ignore stress risers on and near the frictionless support. You must devise and perform your *stress analyses on a ¼-symmetry model with appropriate symmetry boundary conditions.*

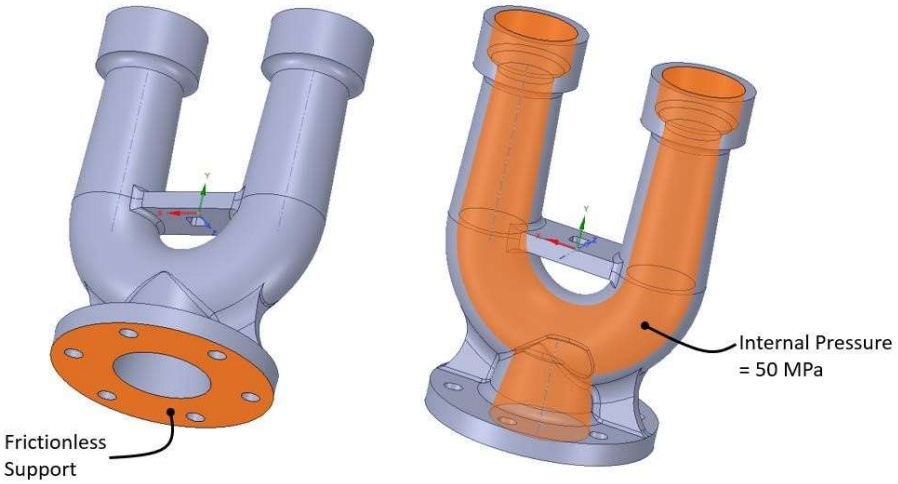


Figure 2

Part B –With reference to Figure 3, notice that the valve design shows *a brace support between the pipes*. What if we remove the brace? Remove it. Analyze the new stress state and determine the new peak equivalent stress value (*within +/- 5 MPa*) and its location.

Once again, use a ¼-symmetry model with the same pressure load, frictionless support, and appropriate boundary conditions.

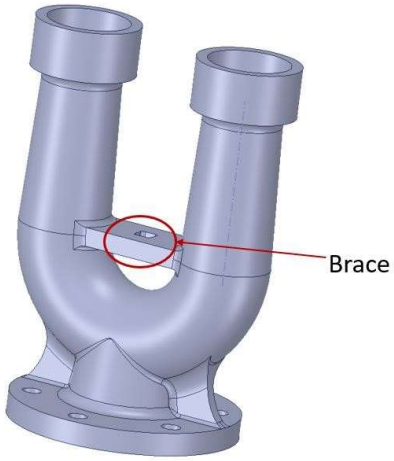


Figure 3

Assumptions and Additional Guidance

1) You must use a ¼-symmeytry model for Parts A and B.

2) Accurate, convergence peak equivalent stress results in terms of your mesh are expected. In so doing, you must explain the approach you used to achieve accurate, converged stresses.