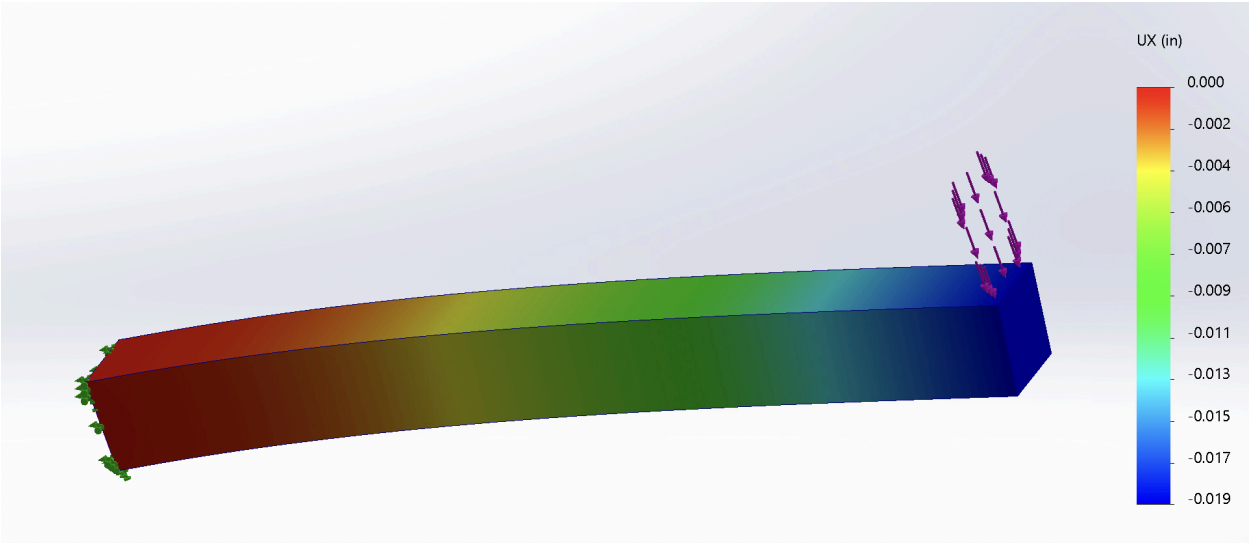
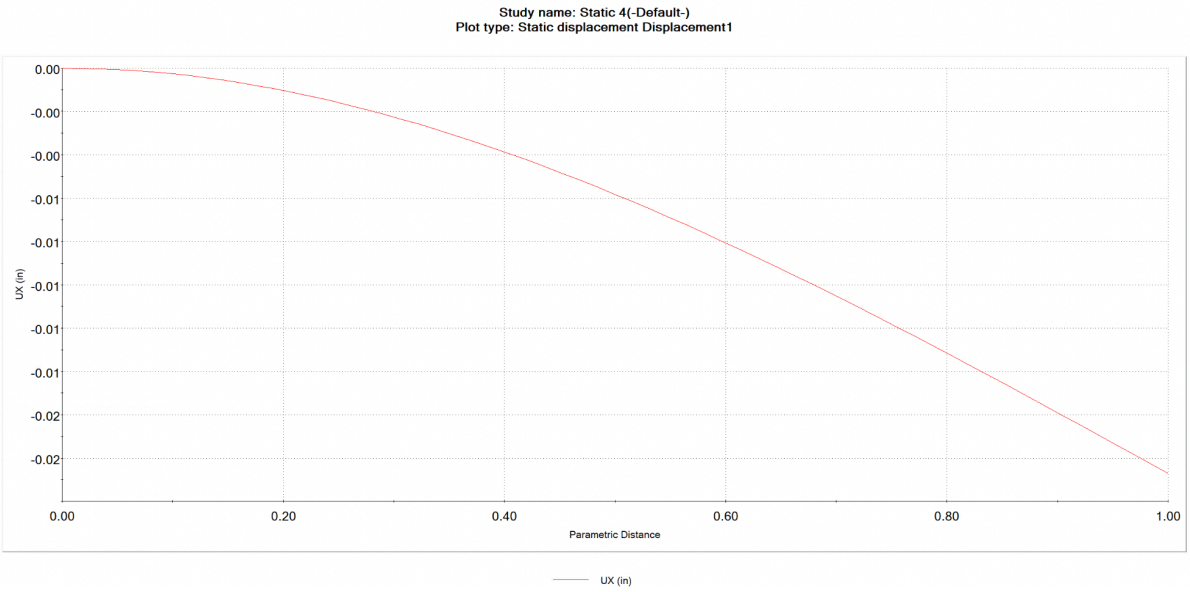
**Deliverable 1** - Deflection plot




**Deliverable 2** - Vertical Deflection Along the Entire Beam

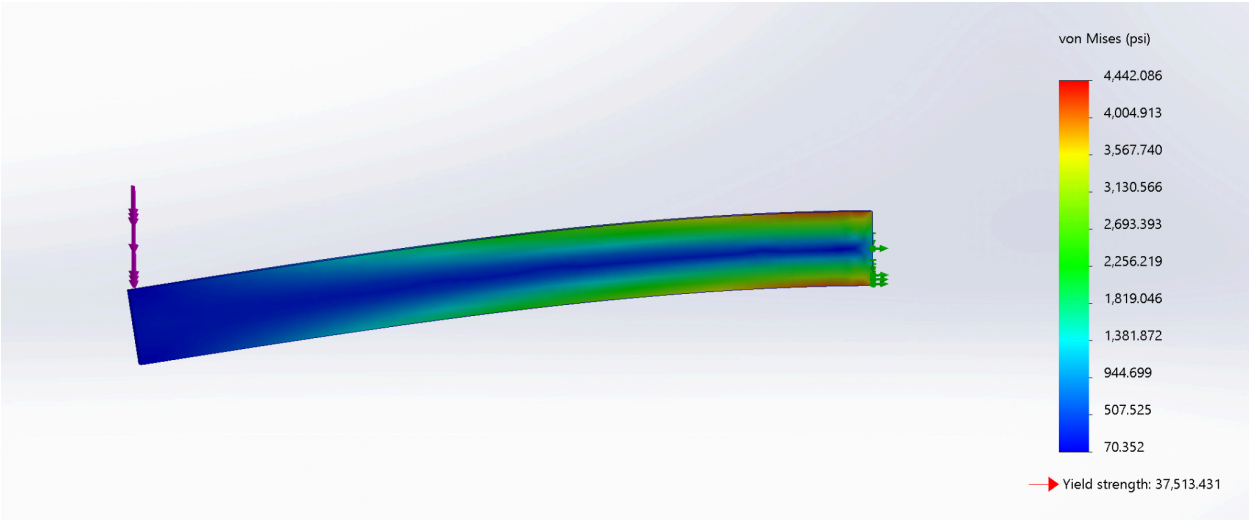



**Deliverable 3** - Maximum Deflection FEA and Beam Theory Verification

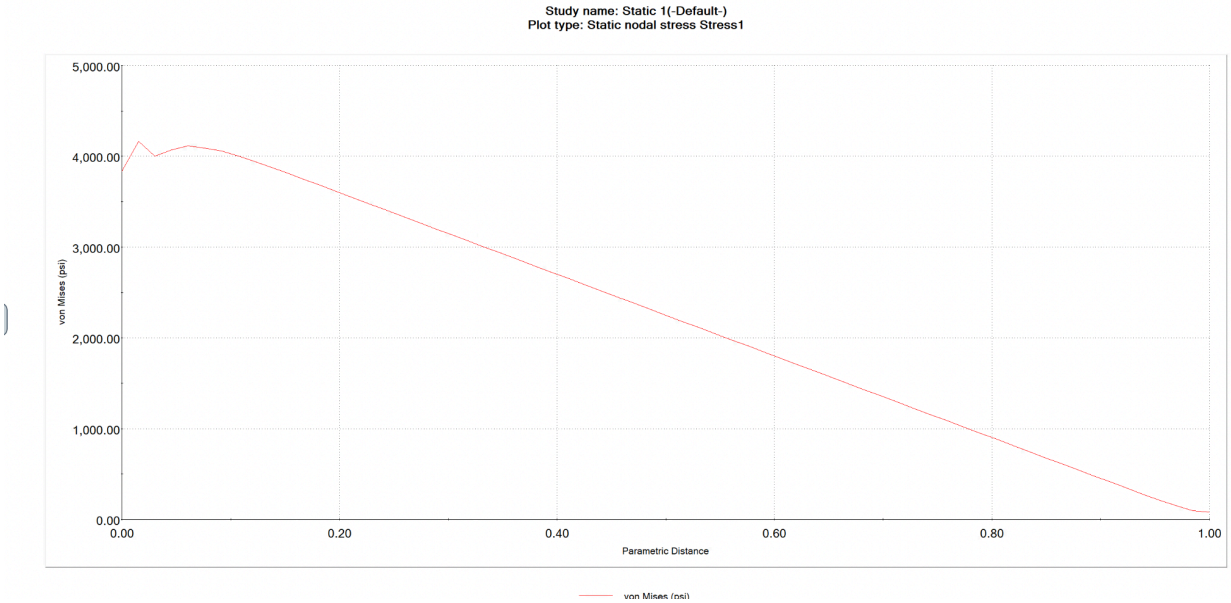
The maximum deflection found with the beam theory is .019 inches. This was computed using the equation for $I_x$ where b and d are both 1 inch, and the $y_{max}$ equation where I is $1/12in^4$, E is

15954151 lb/in$^2$, F is 75 lbs, and L is 10 inches. The maximum deflection shown in deliverable one is also approximately .019 inches, thus the FEA agrees with the beam theory.

**Deliverable 4** - Von Mises Stress Plot




**Deliverable 5** - Stress Along the Top Edge of the Beam

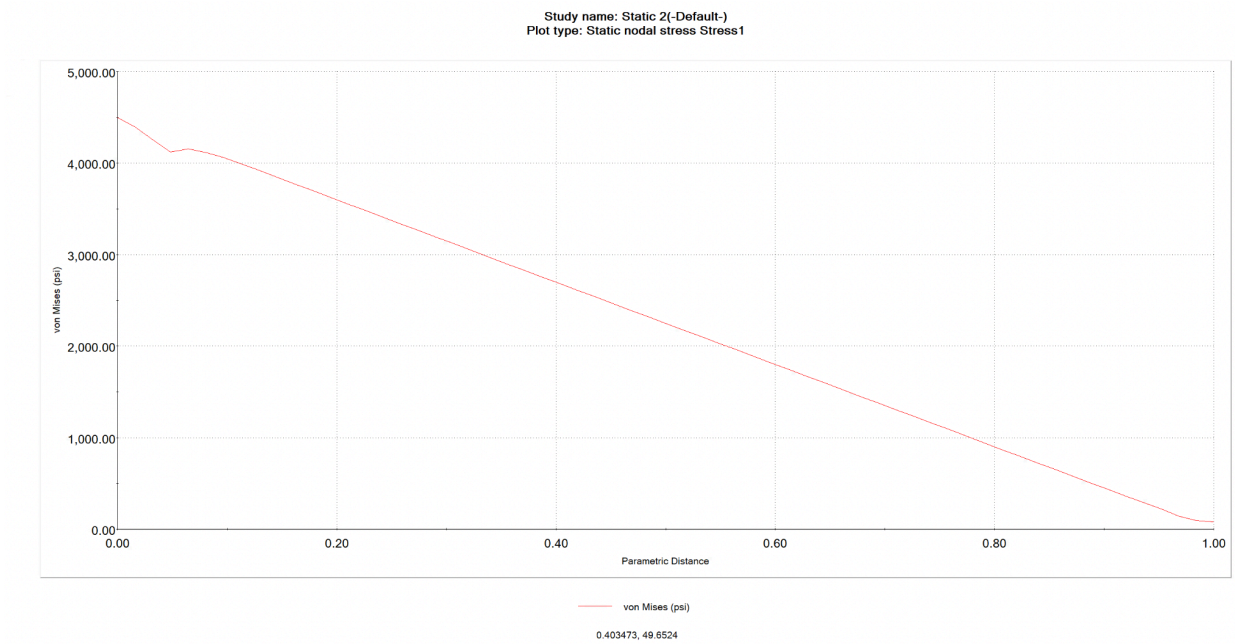



**Deliverable 6** - Verifying max von Mises stress at the wall agrees with beam theory

Using the equation provided for max stress = ($M_c$ * c)/I and $M_c$ = F*L where F is 75 lbs and L is 10 inches, an already computed value for I of 1/12 in$^4$ and .5 inches for c, the max stress is 4518.07 psi which is approximately the maximum value displayed in deliverable four and of just

above 4,442.086 psi. Thus, the max von Mises stress found with FEA agrees with the beam theory.

**Deliverable 7** - Plot the Results Along the Edge with a Modified Fixture and Compare Results




There is less of a mathematical discontinuity in the stress computation because the fixture was modified to more accurately model what restraints the beam has in real life. There is a larger maximum stress displayed in the graph that capturing the value of 4518.07 found in beam theory calculations better than deliverable five.

**Deliverable 8** - Largest Load without Experiencing Plastic Deformation

To explore the maximum load that can be applied, I multiplied the load by a factor of 8 applying a load of 600 lbs (round down from 37500/4400) . At this point, I generated a graph that showed the maximum stress experienced along the edge of a beam was 36,744.516 psi which is just below the yield strength of 37,513.421 psi. For purposes of accuracy, I increased the load to 605 which had a maximum stress of 37,051.00 psi. Thus, the maximum load the beam can handle without experiencing plastic deformation is just above 605 lbs. The image below shows the simulation with a 605 lbs force applied.