

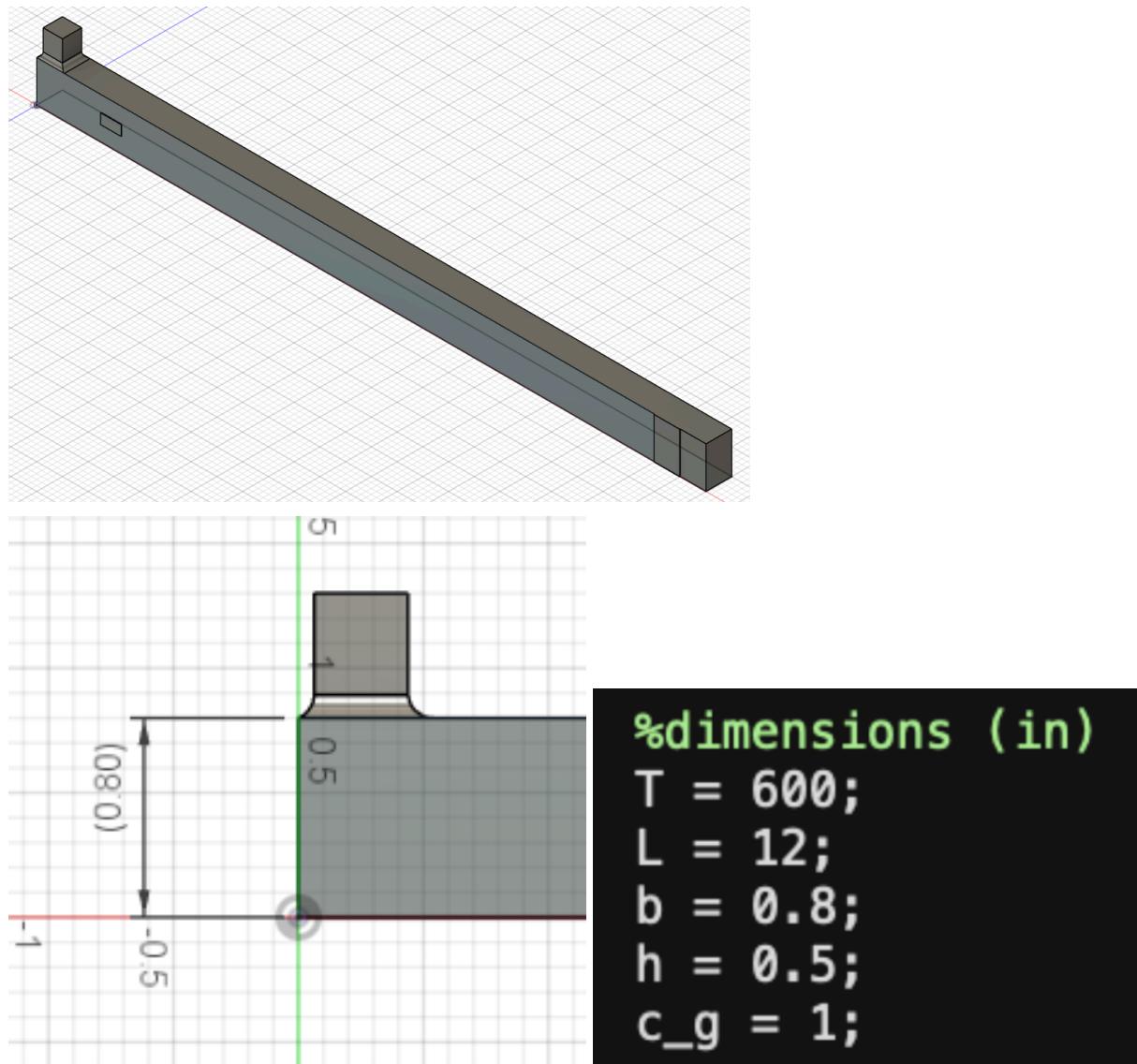
MAE 3270 Final HW

Michael Wywrocki

5.2 - Your Design, Upload to Portfolio

5.2.1 - Results

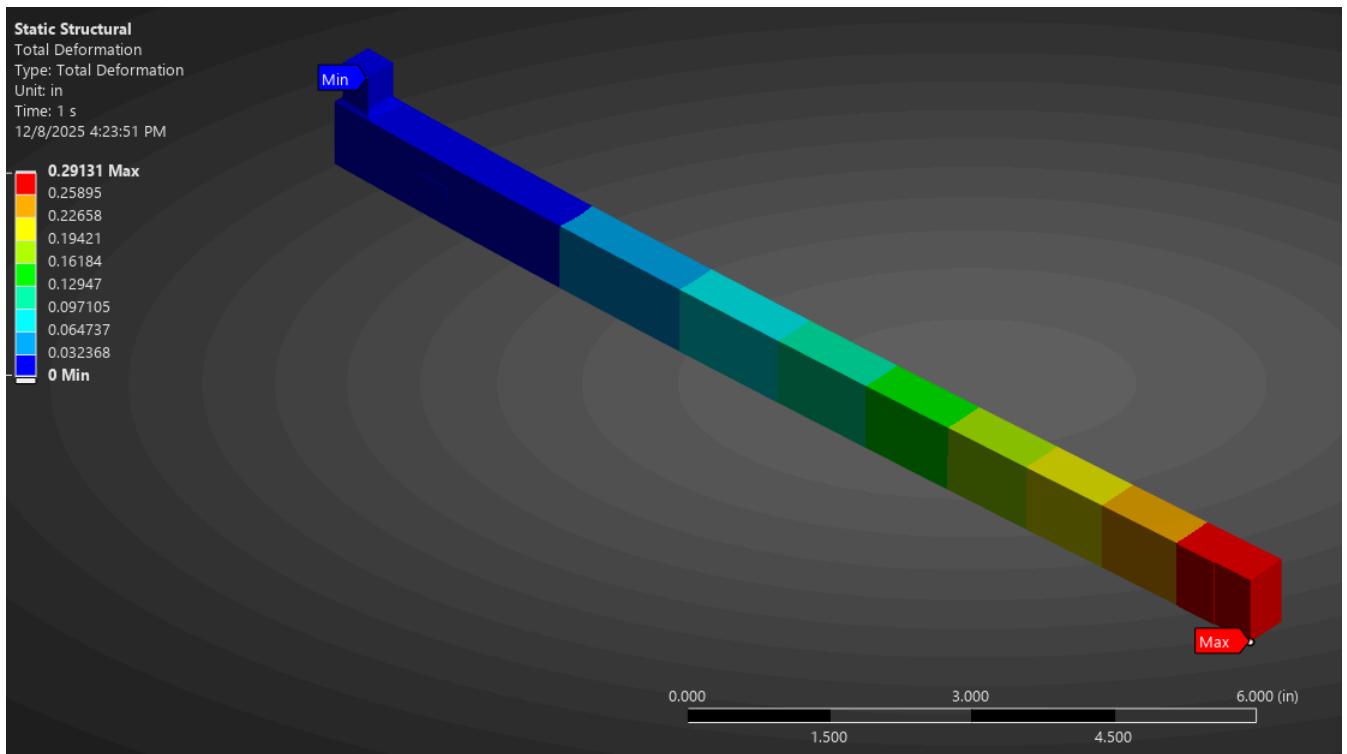
1)



2)

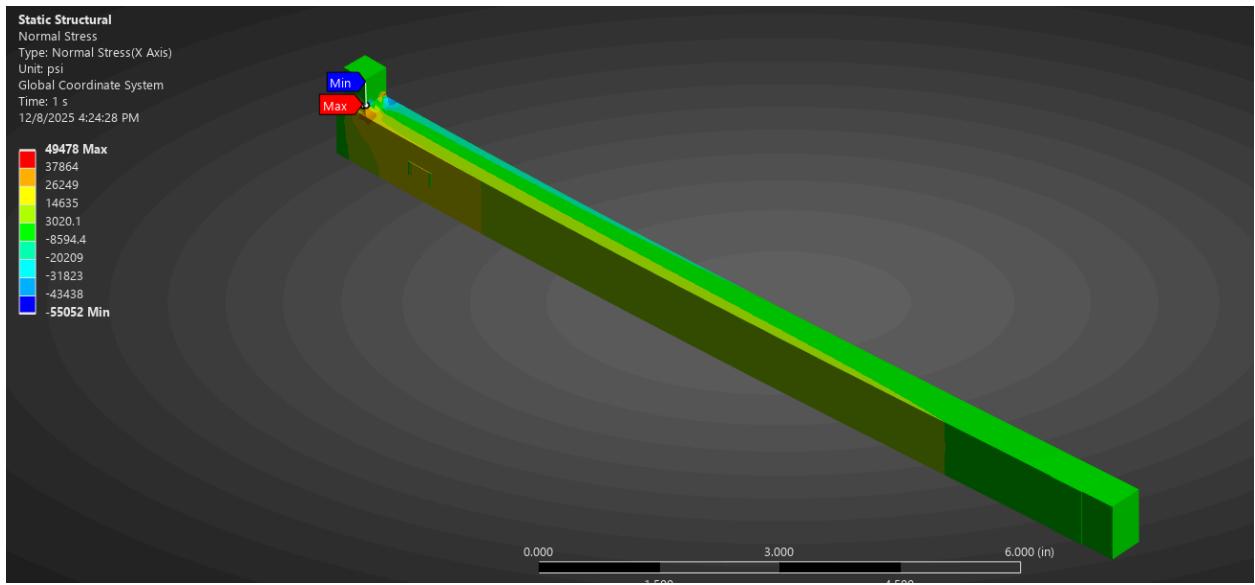
For our design we used Titanium alloy Ti-6Al-4V because it has a really great combination of high strength, low density, and corrosion resistance which is great for demanding and high performance applications. It has a tensile strength of about 130,000 psi, meaning it is capable of withstanding substantial mechanical loads without permanent deformation. Also, its low density relative to steel enables meaningful weight reduction while maintaining structural integrity, which results in a lighter and more durable component that helps have both usability and effectiveness.

3)

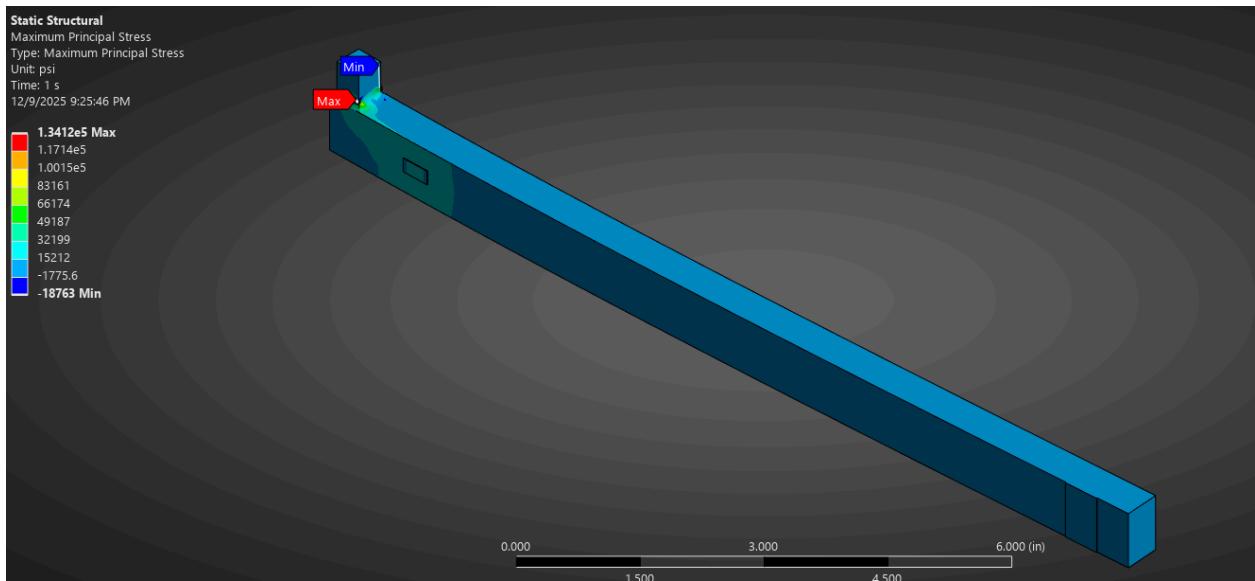


The drive end of the design was set constant by setting the displacement components to 0 so therefore it wouldn't move. Then there was an applied 50 lbf = Torque/Length at the end face in the y-direction.

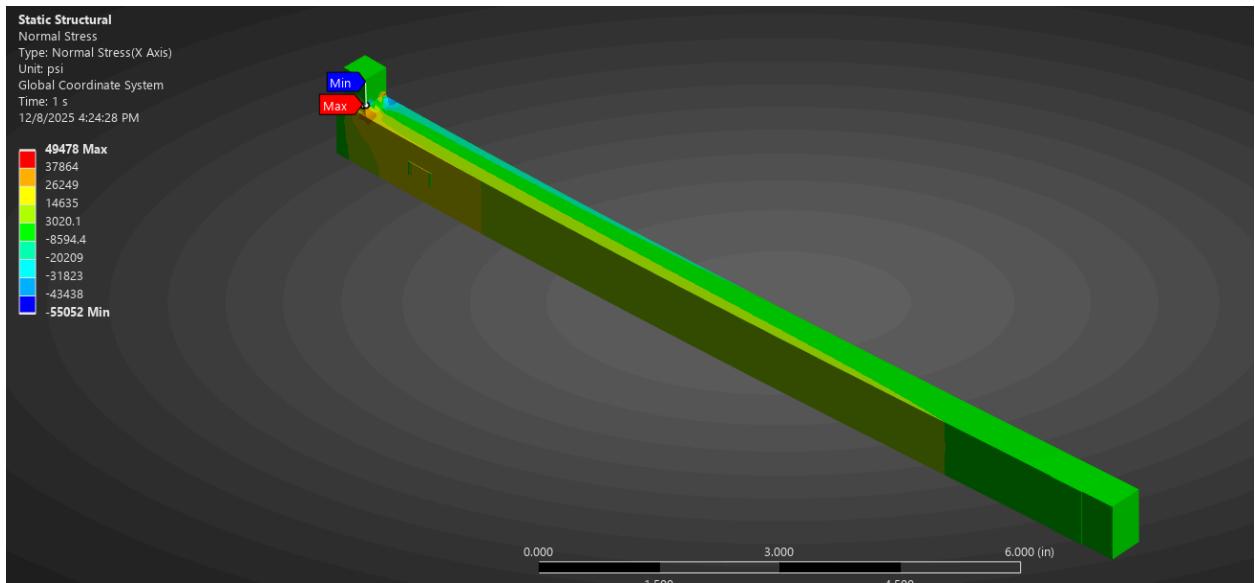
4)



5)



6)



Our maximum normal stress reaches about 55,052 psi, and the maximum deflection at load point is about 0.265 inches. At the strain gauge location, the FEM predicted a stress of about 1180.1 microstrain, and for titanium alloy Ti-6Al-4V is about 19,480 psi, which is close to the matlab estimate of about 1030.9 microstrain which is about 17,027.4 psi.

7)

$$\frac{V_{out}}{V_{in}} = \frac{2k\epsilon}{4}$$

Strain gauge factor: $k=2$
Strain gauge: $\epsilon = 0.0011801$

$$mV/V = 1000 \cdot \epsilon = \boxed{1.18}$$

8)

Cross-area is 0.4 by 0.25 for where the strain gauge will be put.

Strain gauge selected: SGD-2/350-LY11

Normal resistance: 350 omega

Gauge Factor: 2

Active grid length: 0.118 inches

Active grid width: 0.098 inches

Matrix length: 0.299 inches

Matrix width: 0.228 inches