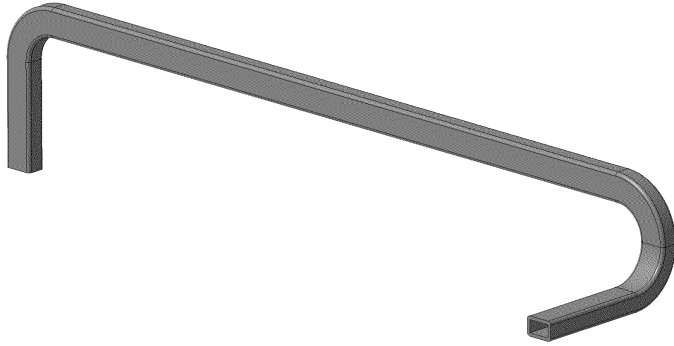


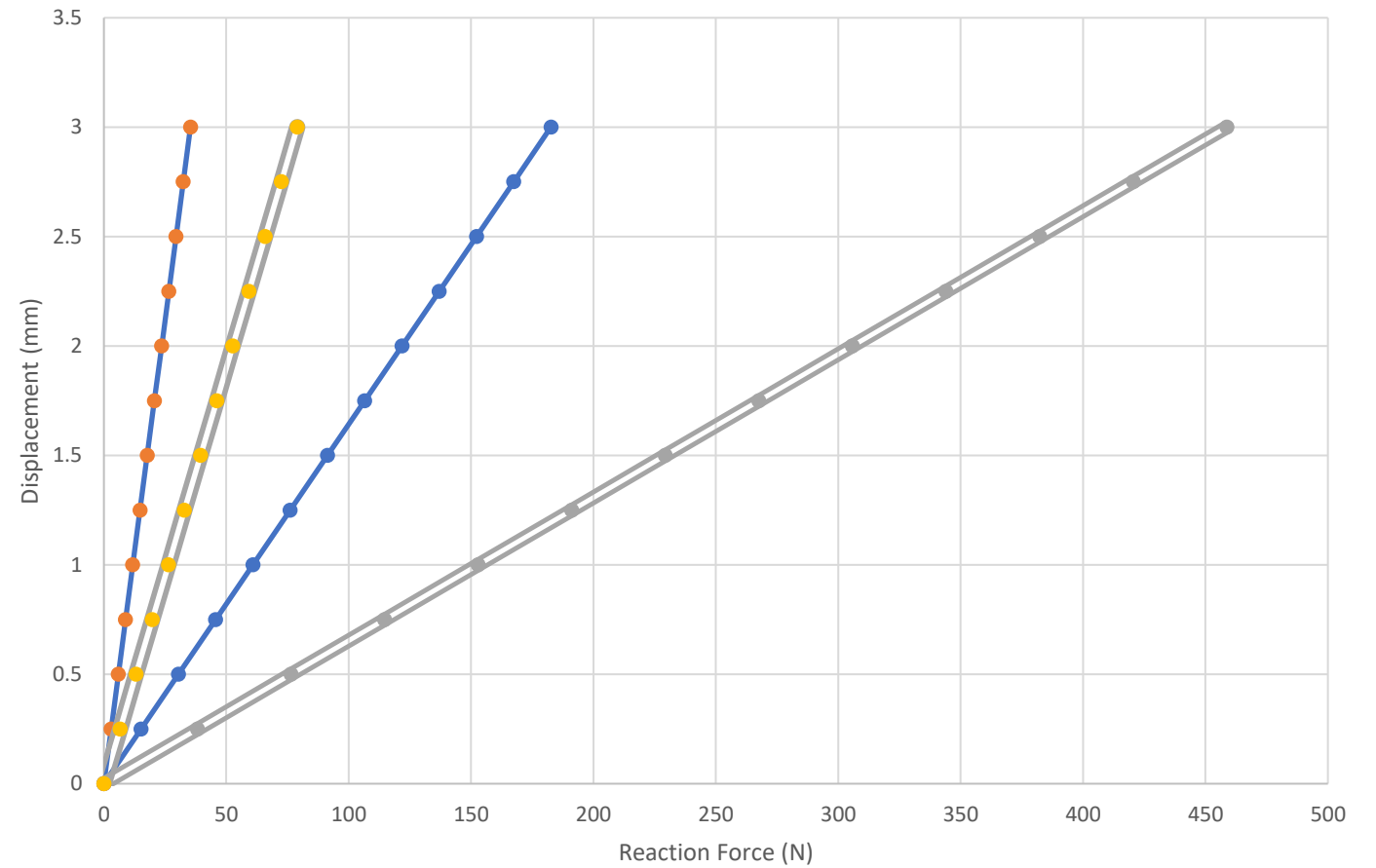
Waveguide Configurations

Joshua Brown



- Threshold to hit 20N reaction forces in single and double-height waveguides:
- 0.3mm for Single Height
- 0.15mm for Double Height

Reaction forces in current waveguide structures with varying displacements

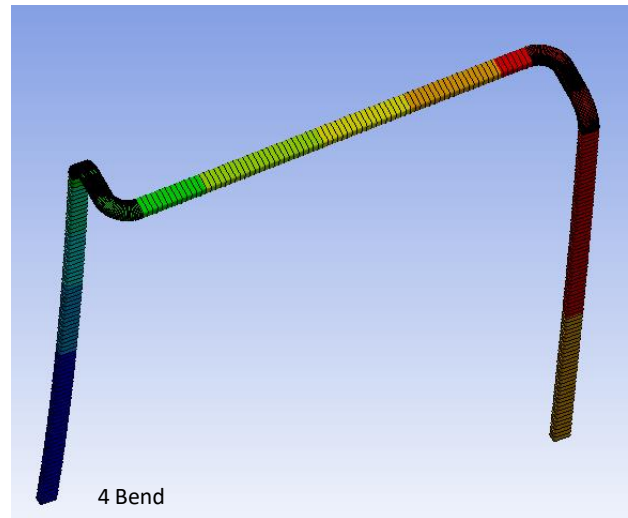
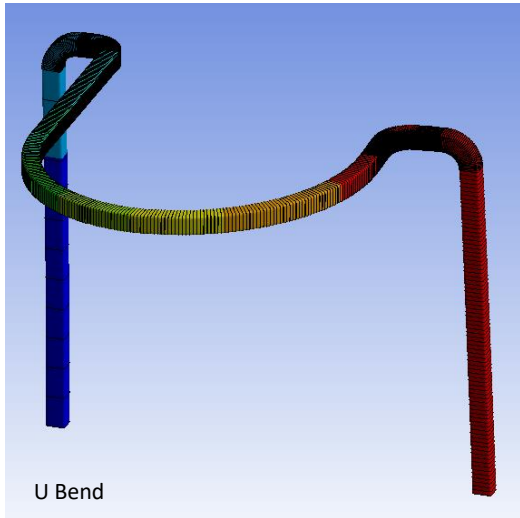
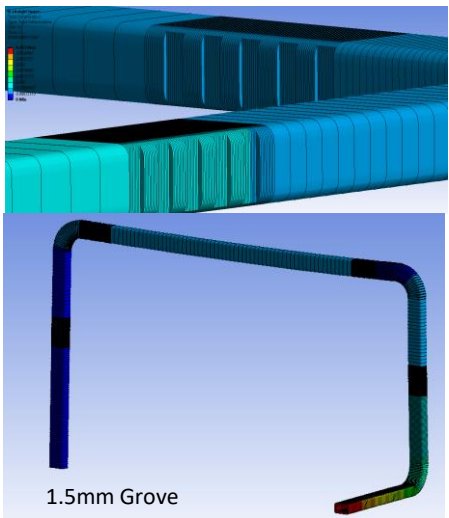
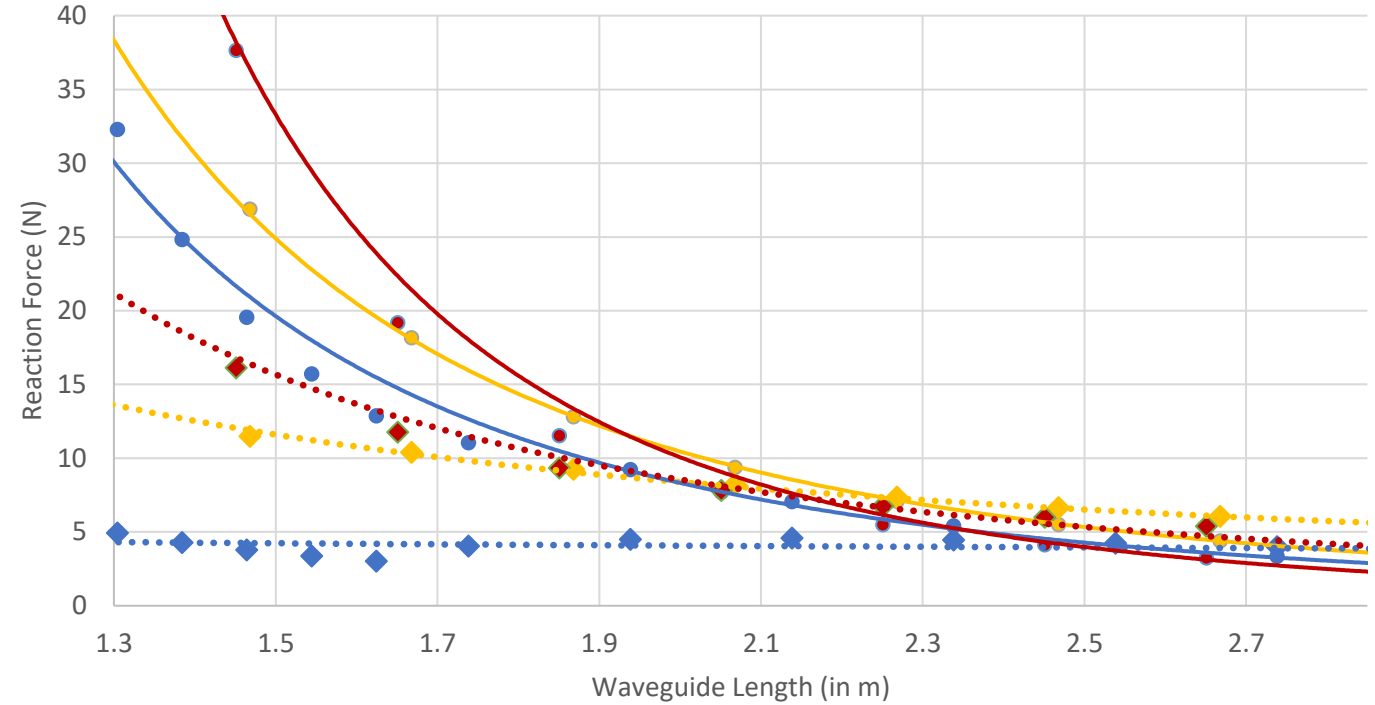


- Change in X displacement, single height wavelength
- Change in Y displacement, single height waveguide
- Change in X displacement, double height waveguide
- Change in Y displacement, double height waveguide

1mm Displacement 2 Beam Scenarios

- Threshold to hit 20N reaction forces drops to <1.5m
- U Bend design becomes more efficient after 2.36m

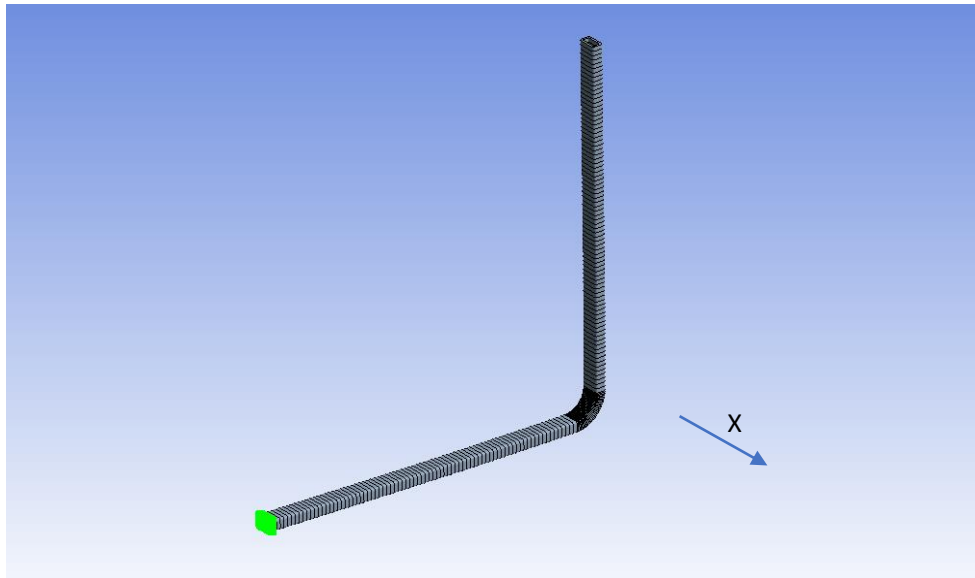
Comparison of best performing structures



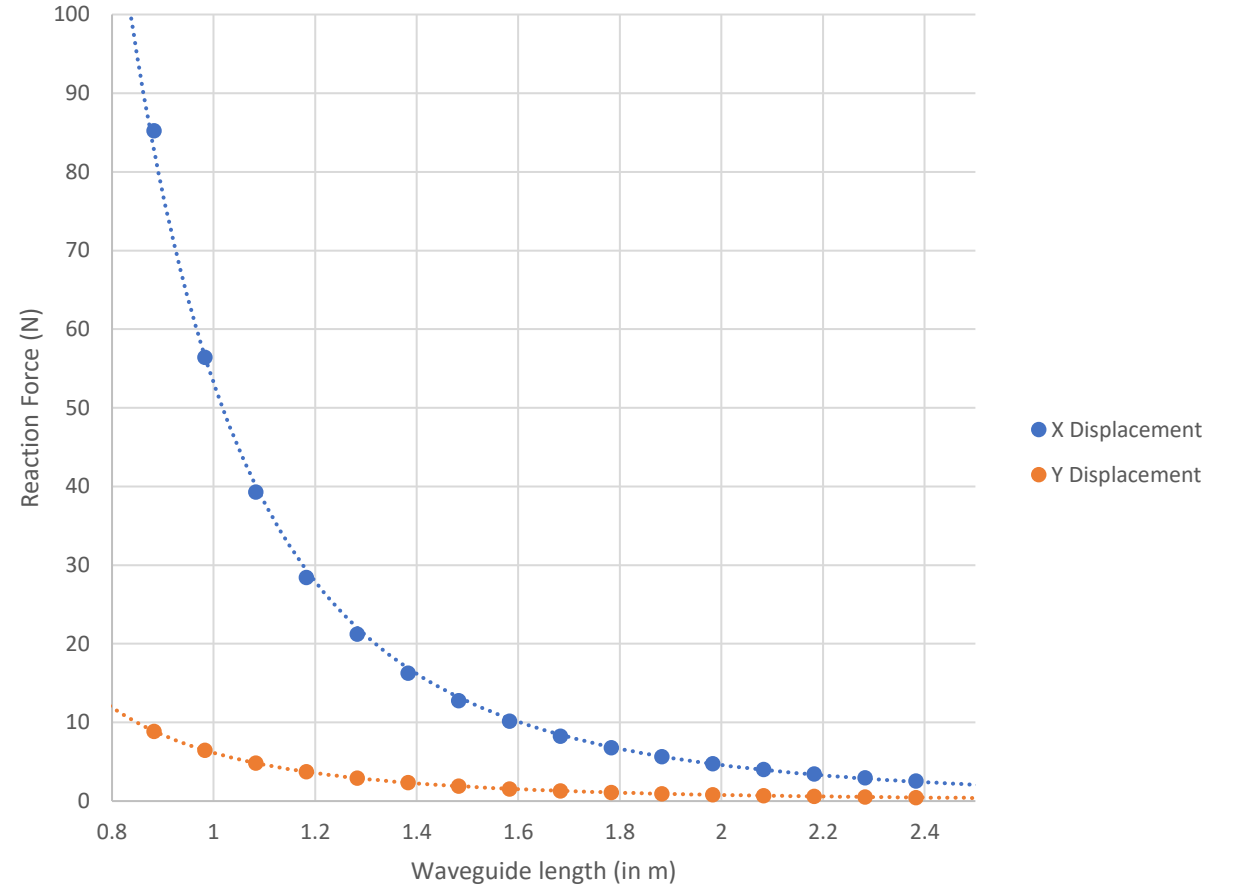
- X Displacement (1.5mm Grove)
- Y Displacement (1.5mm Grove)
- X Displacement (U Bend)
- Y Displacement (U Bend)
- X Displacement (4 Bend)
- Y Displacement (4 Bend)

- L Shape waveguide design to produce 20N at only 1.1 m in length

- Achieves 20N criteria with only one bend and with 40cm less waveguide than the U Bend

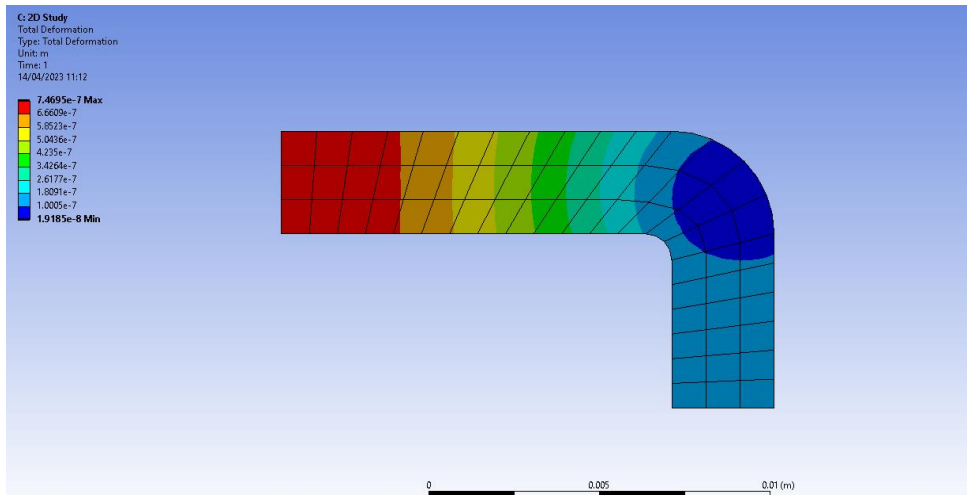


L Shape Waveguide Design

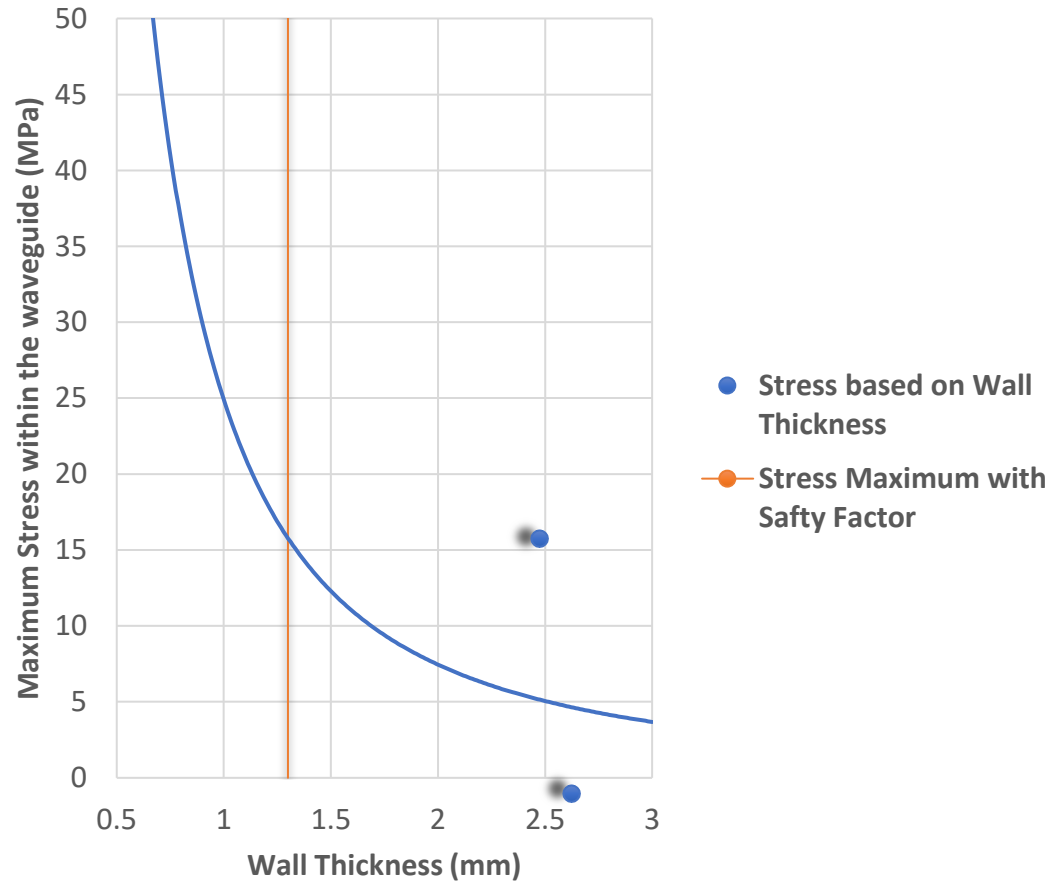


Changing the waveguide thickness

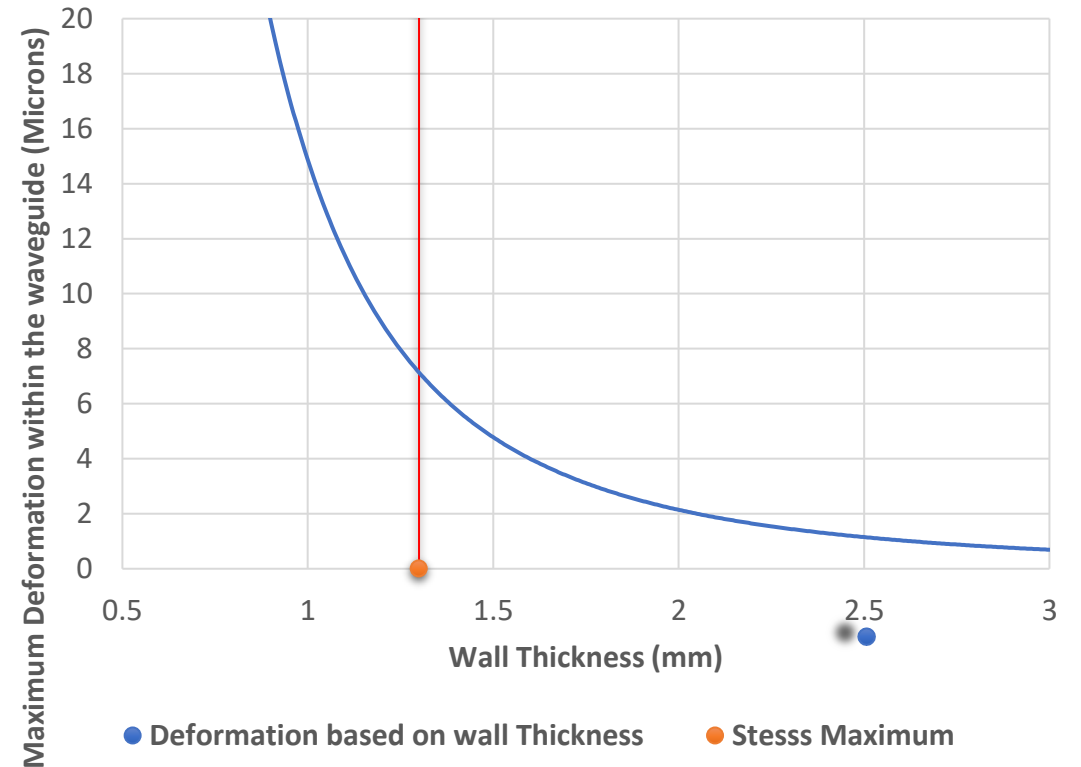
- Current waveguide thickness is 3mm in order to support the pressure differential across the waveguide without changing the internal geometry
- Simulations suggest this could be changed to 2mm



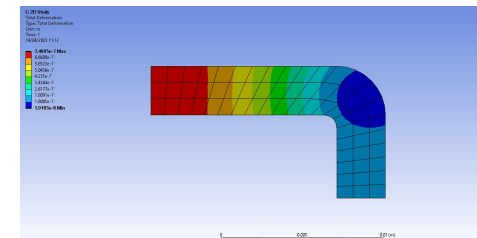
Max stress based on Wall Thickness

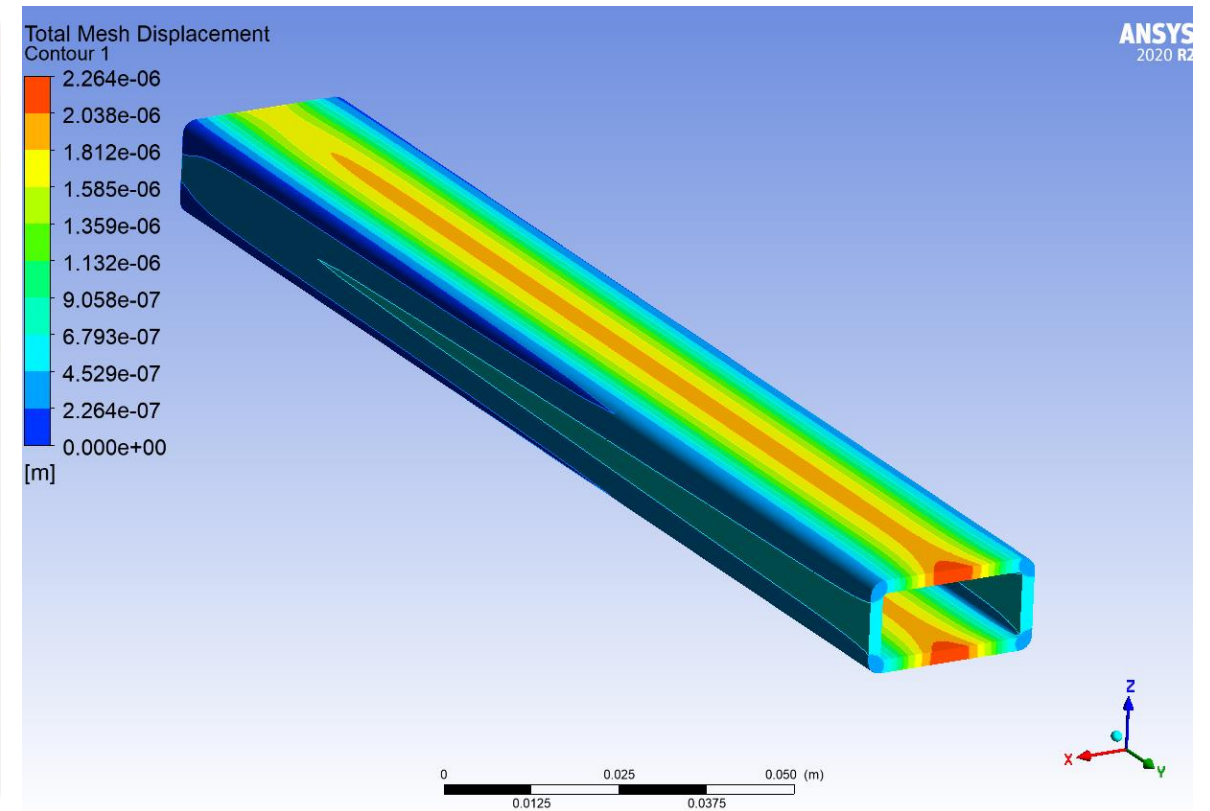
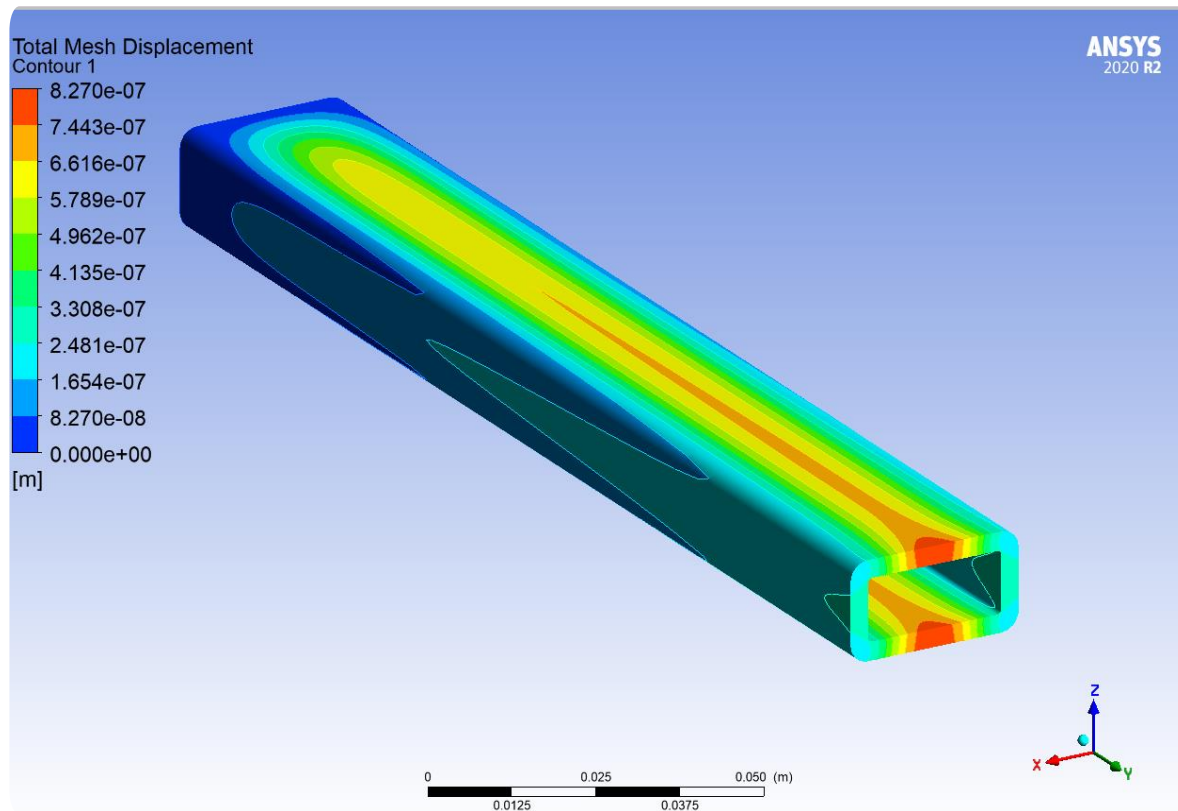


Maximum Deformation based on Wallthickness under 1 Bar of Pressure



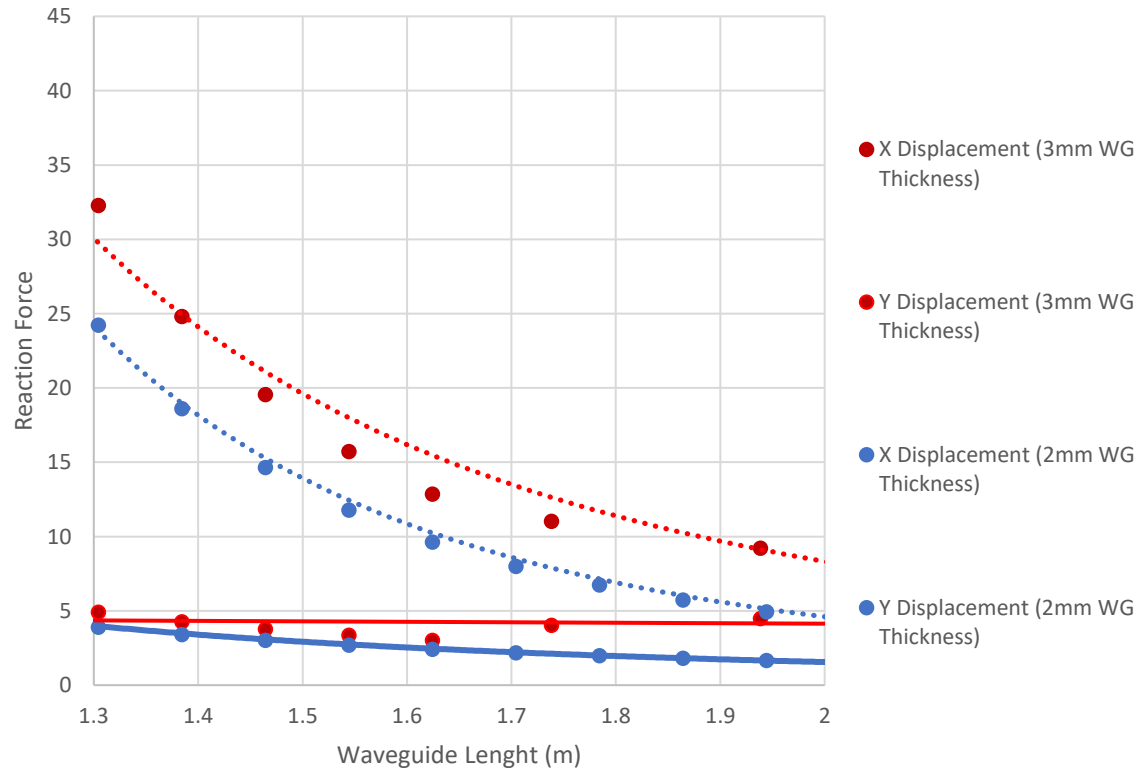
- Assuming a stress maximum of approximately half of the yield stress
- Limiting factor is mainly the deformation of the internal geometry





- Verification study using a 400mm length, 3mm thickness waveguide
- Simulation shows that the 3D model approximately aligns with the 2D model when constrained at one end

U bend - 2/3mm Comparison



Waveguide Lengths can be reduced to

- <1.4m U-Bend
- <0.9m L-bend

L Shape Waveguide Design

