PENN HYPERLOOP

NoDiggity V1

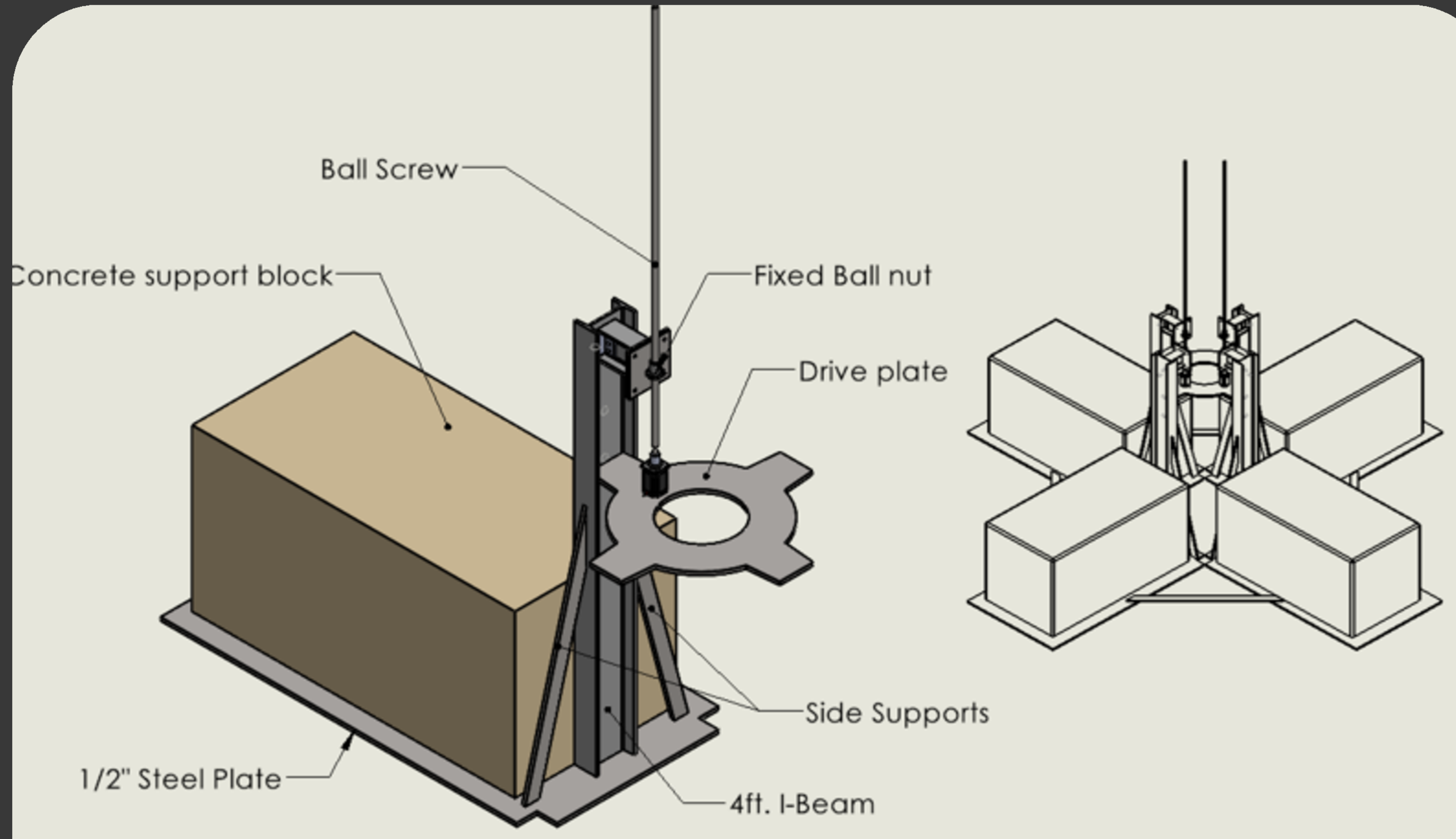
Founding member of what came to be the Penn Hyperloop team later. Our goal was to dig a 1 meter hole with a 0.5 meter diameter in Bastrop, Texas soil. I was the Propulsion System RE (responsible engineer) – an independent on-ground structure that would push the TBM vertically downwards as it excavated.

In addition, as 1 of 3 mechanical team members, I assisted in the machining of custom gearmotor keys, forming the machine's outer shell, and troubleshooting a host of competition safety related requirements.

Aggressive 2 month design phase + 3 week construction phase to win 1st place in our Digging Mini-Event at NaBC '24 (for the Boring Company).

Propulsion System - NoDiggity V1 - Penn Hyperloop

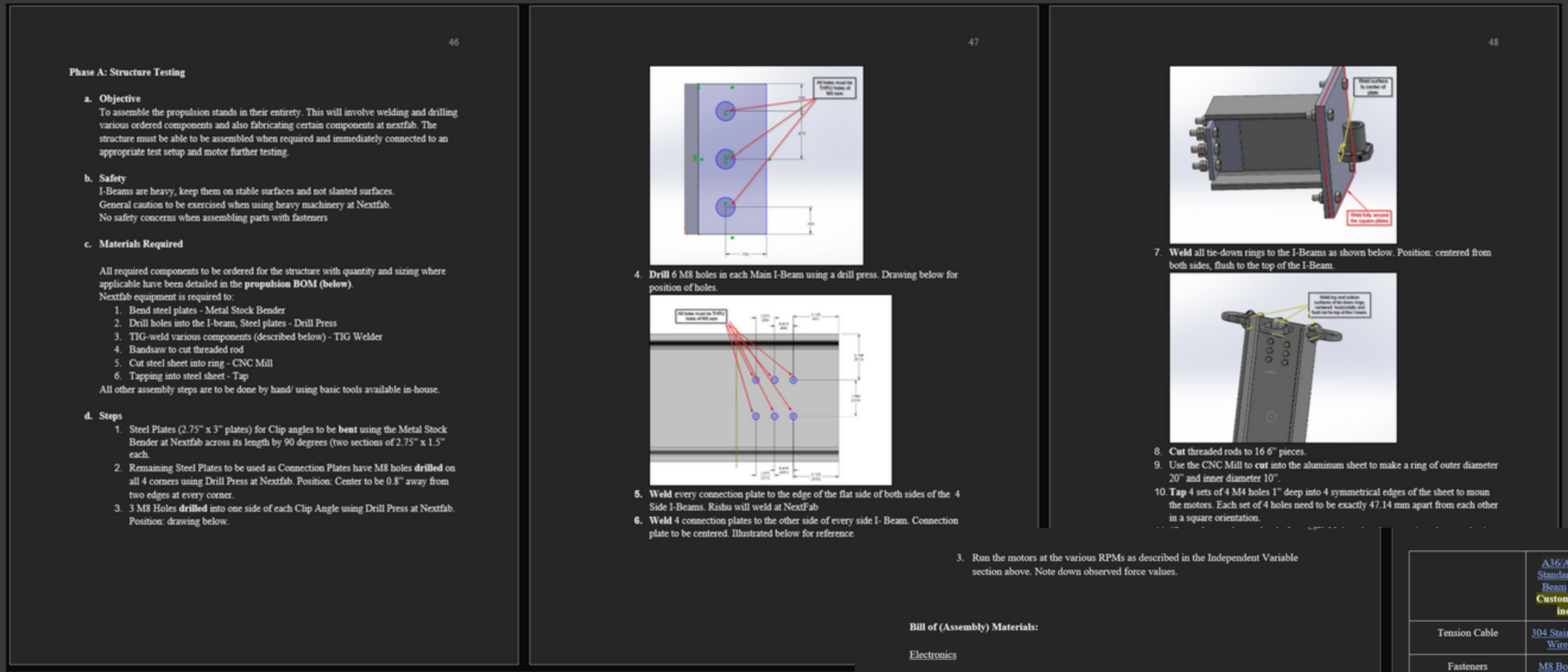
- Designed force reaction and torque reaction into the structure
- Switched from traditionally preferred linear actuators to ball screws to make a 5x cost reduction in this system.
- Learnt and performed weld shear calculations for key joints
- Conducted bolt shear analysis at fastened joints
- Identified and sourced metal from local vendors at discount rates and <1 week lead times.
- Attempted force testing to characterize ball screw movement as an actuator (with help of controls team)



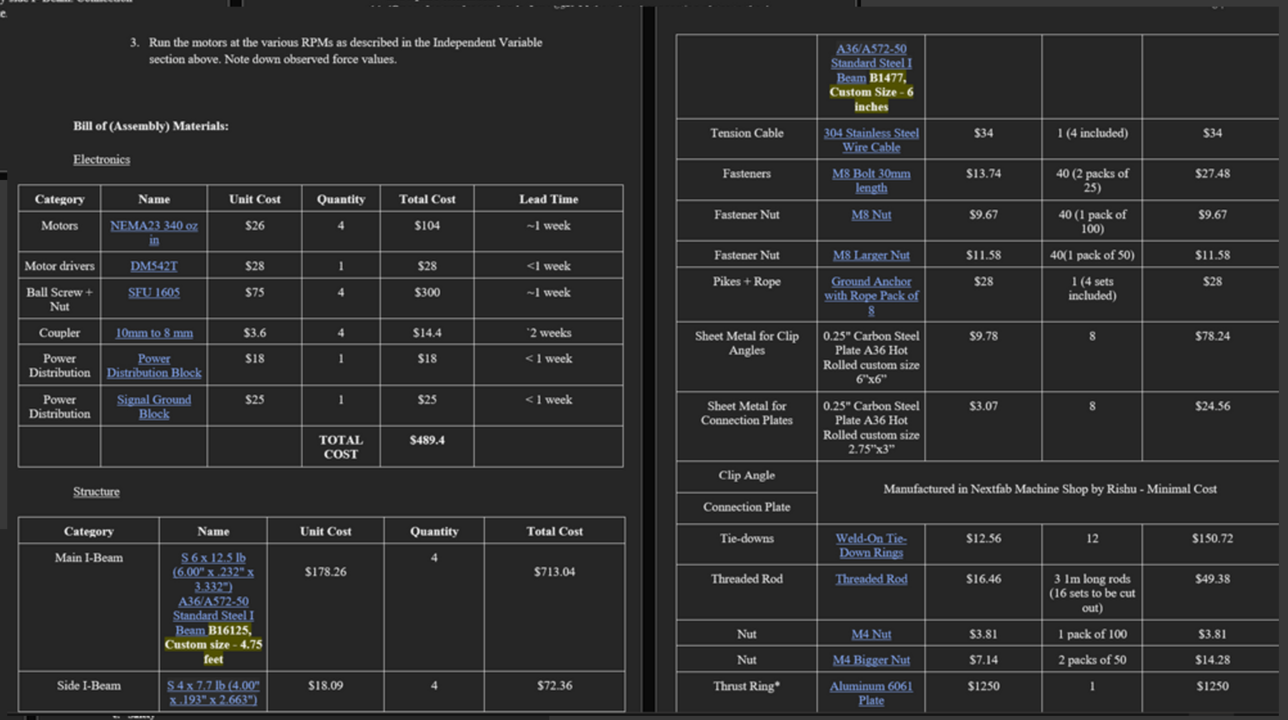
- Propulsion Method: SFU1605 Ball Screw Linear Actuator
- Maximum Thrust Force: >1600 lbf
- Motor Type: NEMA23 DC Stepper Motors
- Torque Reaction Method: Slotting into I-Beam Webs and Ground Screws
- Thrust Reaction Method: Four Concrete Bunker Blocks on ½” thick steel plates

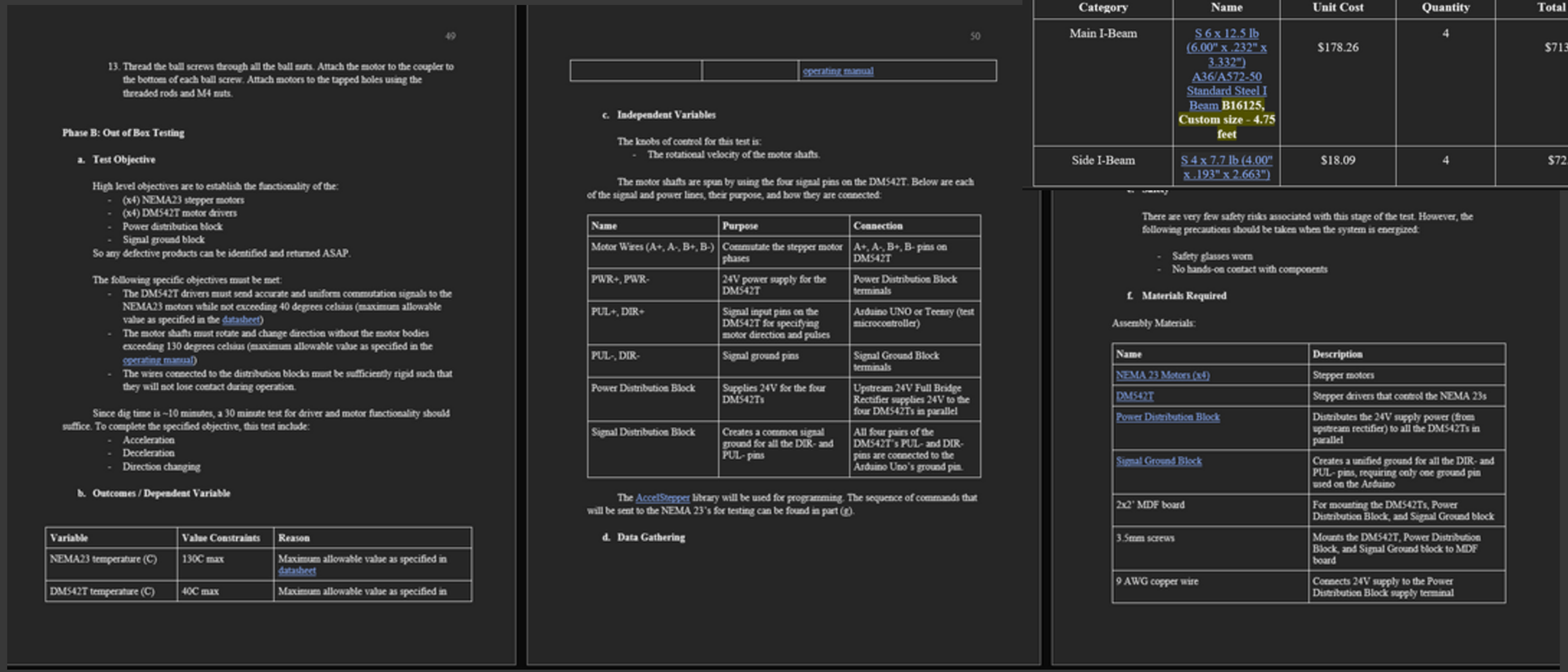
PROPULSION

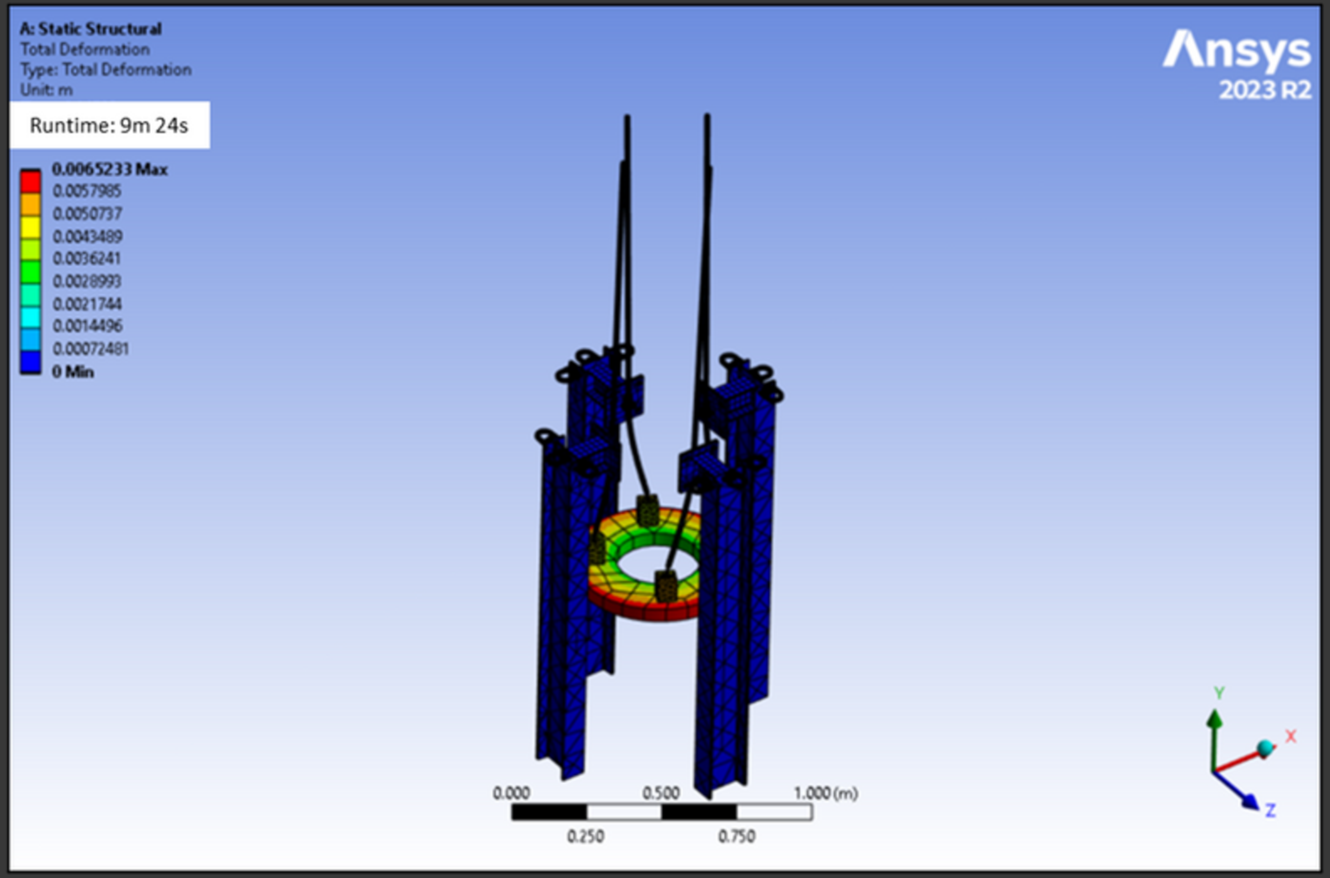
Propulsion System - NoDiggity V1 - Penn Hyperloop



Assembly Plans, Test Plans and BOM's generated for owned system







ANSYS FEA – Stress and Deformation analysis to ensure viability of structure and associated FOS.