



University of Idaho

College of Engineering

FITS LIKE A GLOVE

IDAHO NATIONAL LABS: TENSILE

TESTING SYSTEM

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Mentor: Anas Nawafleh

Sponsor: Randal Fielding, Idaho National Laboratory

OBJECTIVE



- Design a tensile testing system that will fit through an 8-inch access port inside a glovebox and can perform tensile tests at temperatures reaching 700 °C.

VALUE PROPOSITION



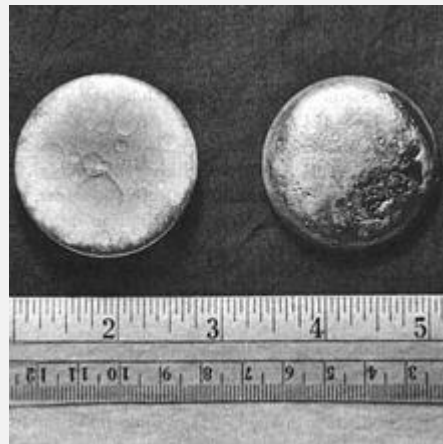
While small-scale tensile testing systems do exist, they are expensive, cannot be easily assembled in a glovebox, and do not perform high temperature tests.

Our task for this project is to create a tensile testing system for Idaho National Laboratory that meets these requirements.

BACKGROUND



- A glove box is required to protect people from the potentially harmful conditions that could arise from the testing of certain alloy such as INL's current project using Ur-Pt-Zr alloys.
- Current existing small-scale tensile testing systems are:
 - Extremely expensive
 - Do not have heating systems attached.
 - Cannot fit through a glovebox's 8in hole.



REQUIREMENTS



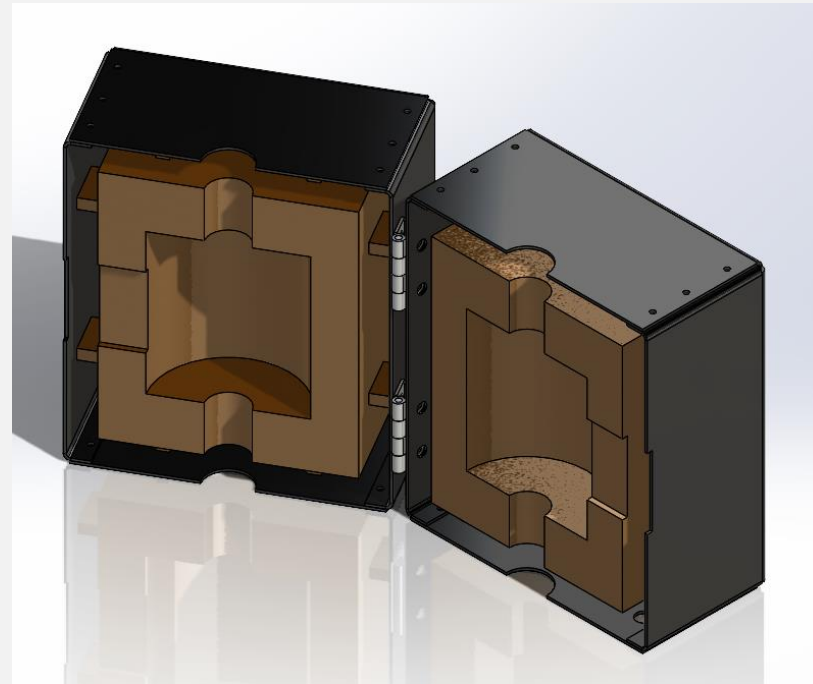
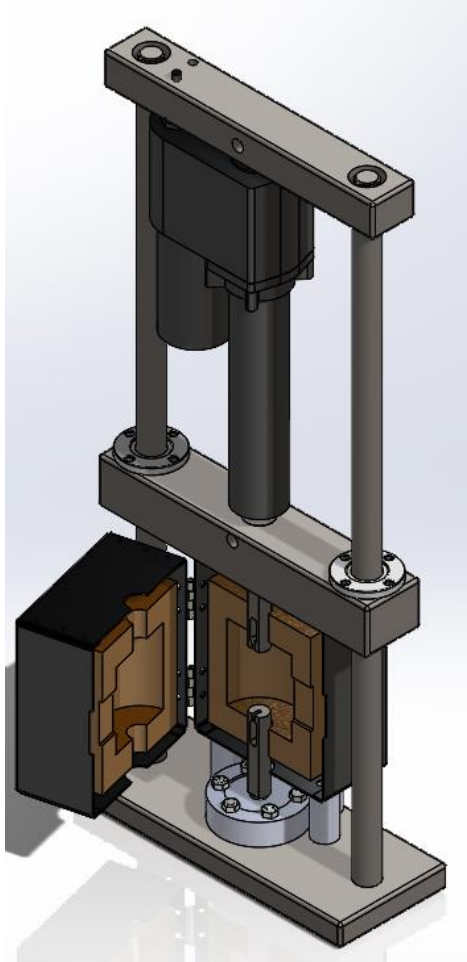
- Be able to complete tests remotely
- Small as possible to fit into 8" hole of glovebox
- Electronically sparse
- Assembled in glove box with thick gloves.
- Perform high temperature tests up to 700°C



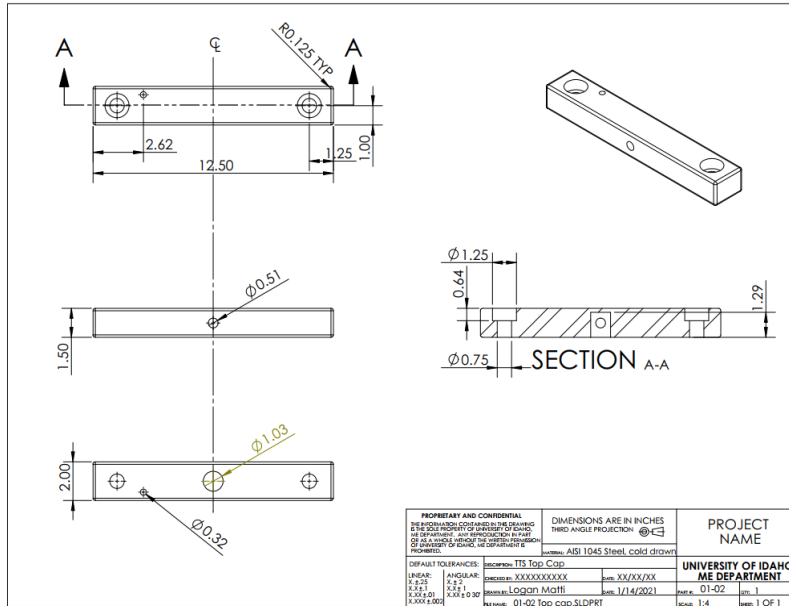
SYSTEMATIC REVIEW



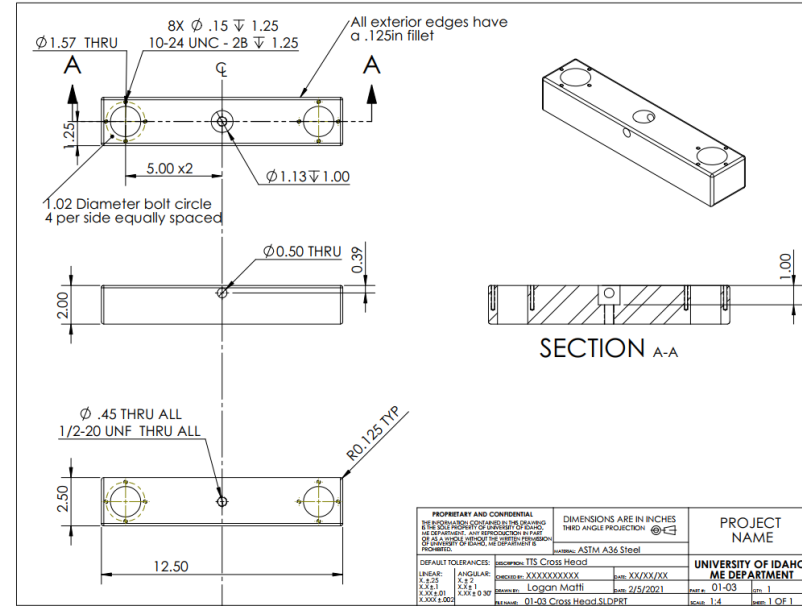
System SolidWorks: Frame (Showing physical models From SolidWorks)



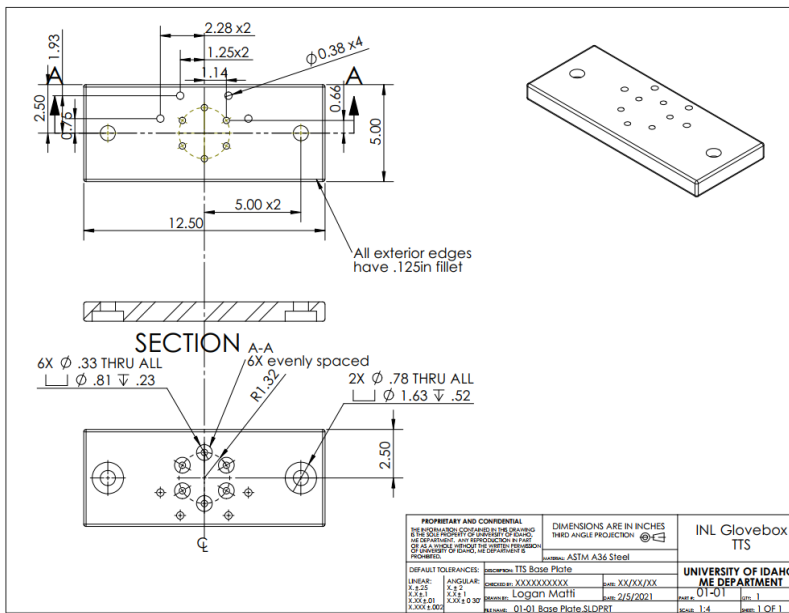
DRAWINGS



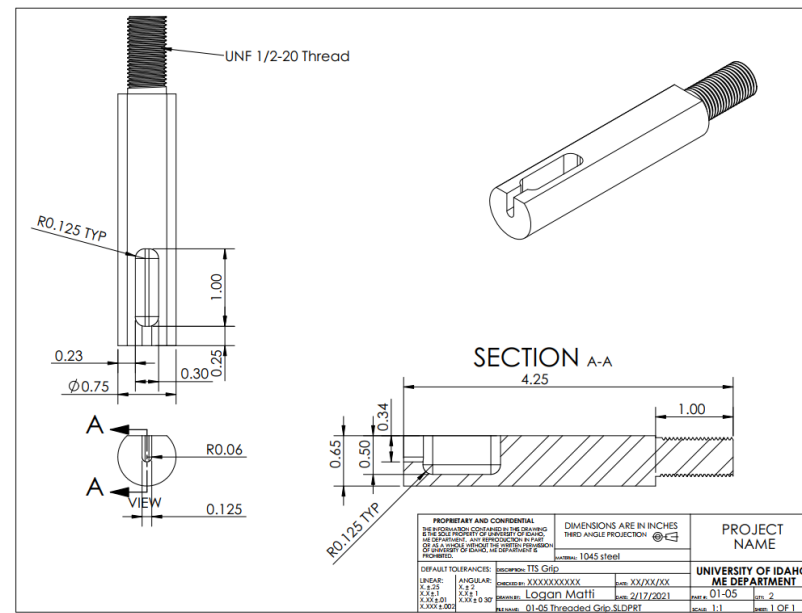
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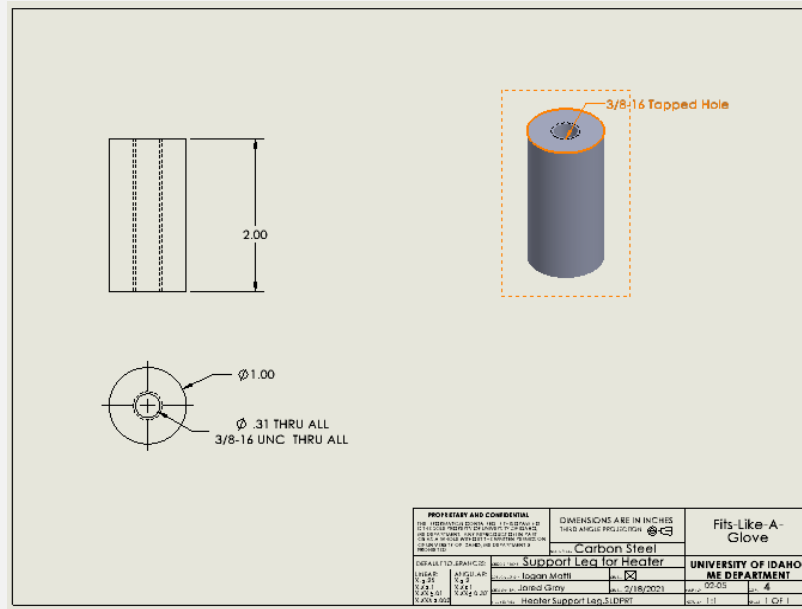
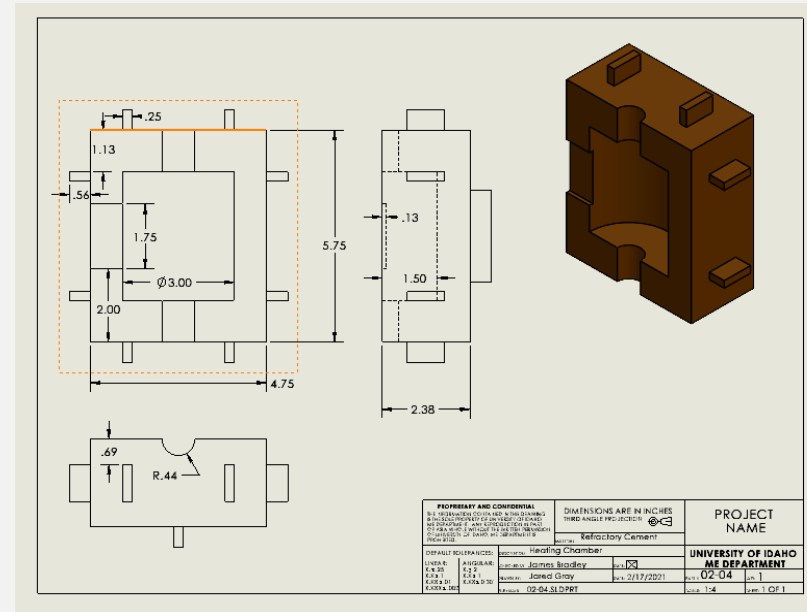
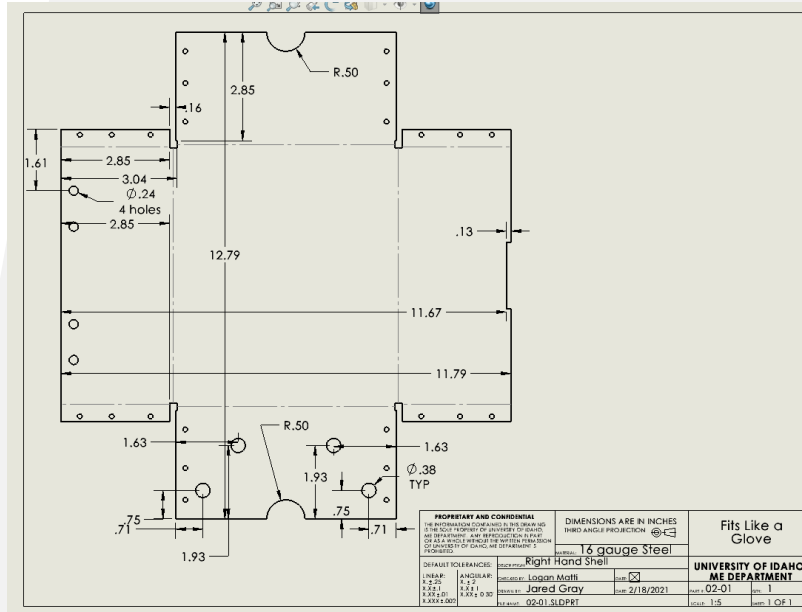


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DRAWINGS



INSTRUMENTATION



Two Interfaces

LabView Temperature



Extensometer



Load Cell



Power Source



Labjack



Linear Actuator



PID Controller



Arduino

Thermocouples



Linear Actuator will be controlled by Arduino.

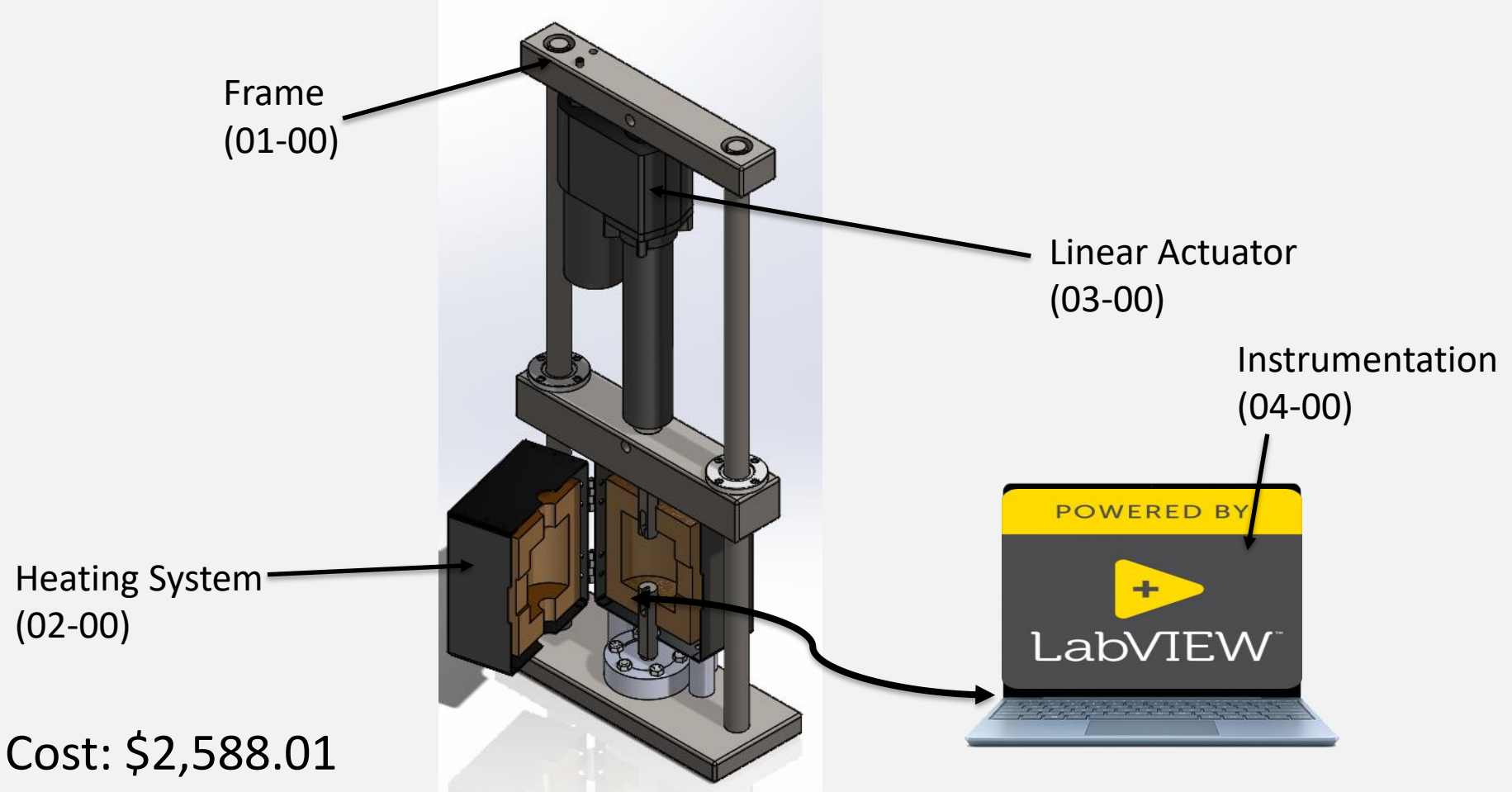
Thermocouple values attached to sample will be stored in LabView.

MANUFACTURING/BOM PLAN



Main Assembly:

1. Frame
2. Heating Unit
3. Linear Actuator
4. Instrumentation



Current Manufacturing Cost: \$2,588.01

POTENTIAL RISKS



- The weight of the steel = Con: High shipping cost, Pro: Assembled TTS will have a low Center of Gravity
- Assembly in glovebox: Will test assembly and disassembly
- Still need connection for load cell, LabView coding for DAQ, motor and heater control
 - Programming difficulties due to irregular connection types that do not mesh with readily available DAQ devices. May need to obtain an intermediary conditioning device to connect the load cell to the LabView UI
- External temperature of the heating system and components.

SUMMARY OF DVP



Test TTS assembly/Disassembly to fit with in an 8in hole.

Test force from linear actuator to test functionality up to 1500lbs.

Validate requirement of wire for the heat temp is up to 700C

Measure Temperature of the outside shell is below 50C

Test TTS on test specimen up to 700C

Test functionality of Instrumentation (Input gives the correct Output)



THANK YOU!

QUESTIONS?