

OBJECTIVE

Wildfires are a significant and growing cause of public devastation. We are designing and testing a fire-resistant wind tunnel to simulate embers dispersed through a forest fire. This wind tunnel will need to withstand extreme heat, and results from these experiments will help us better understand how wildfires spread to help save lives and property.

Objective: Design a wind tunnel that integrates an established ember generator (below) to conduct ember simulations



KEY REQUIREMENTS

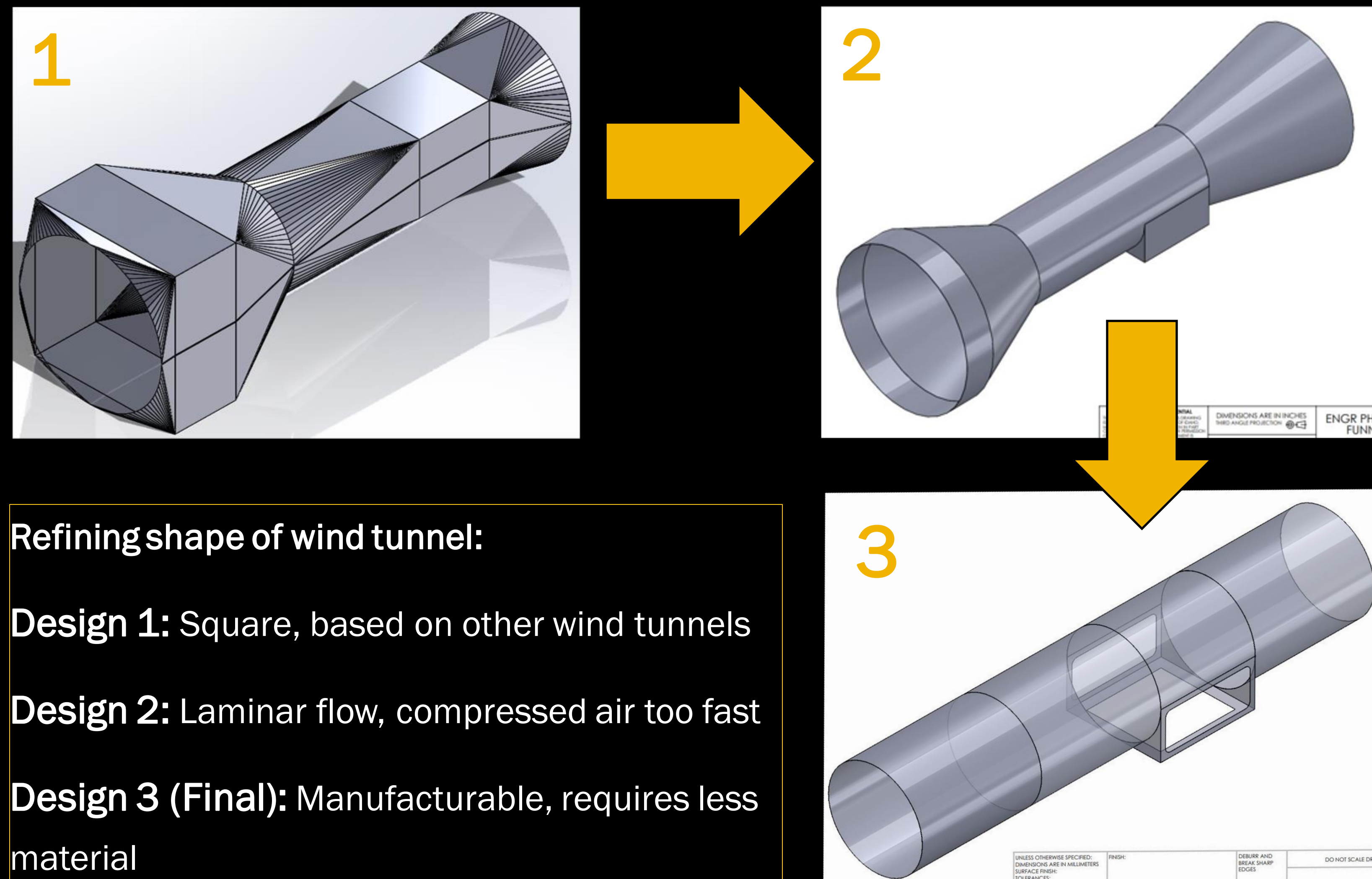
Primary Requirements:

- Temperature: <760° C (1400° F)
- Flow: Homogenous-Laminar
- Max Speed: 5-10 m/s



Full List of Requirements
Linked to QR Code

WIND TUNNEL SHAPE



Refining shape of wind tunnel:

Design 1: Square, based on other wind tunnels

Design 2: Laminar flow, compressed air too fast

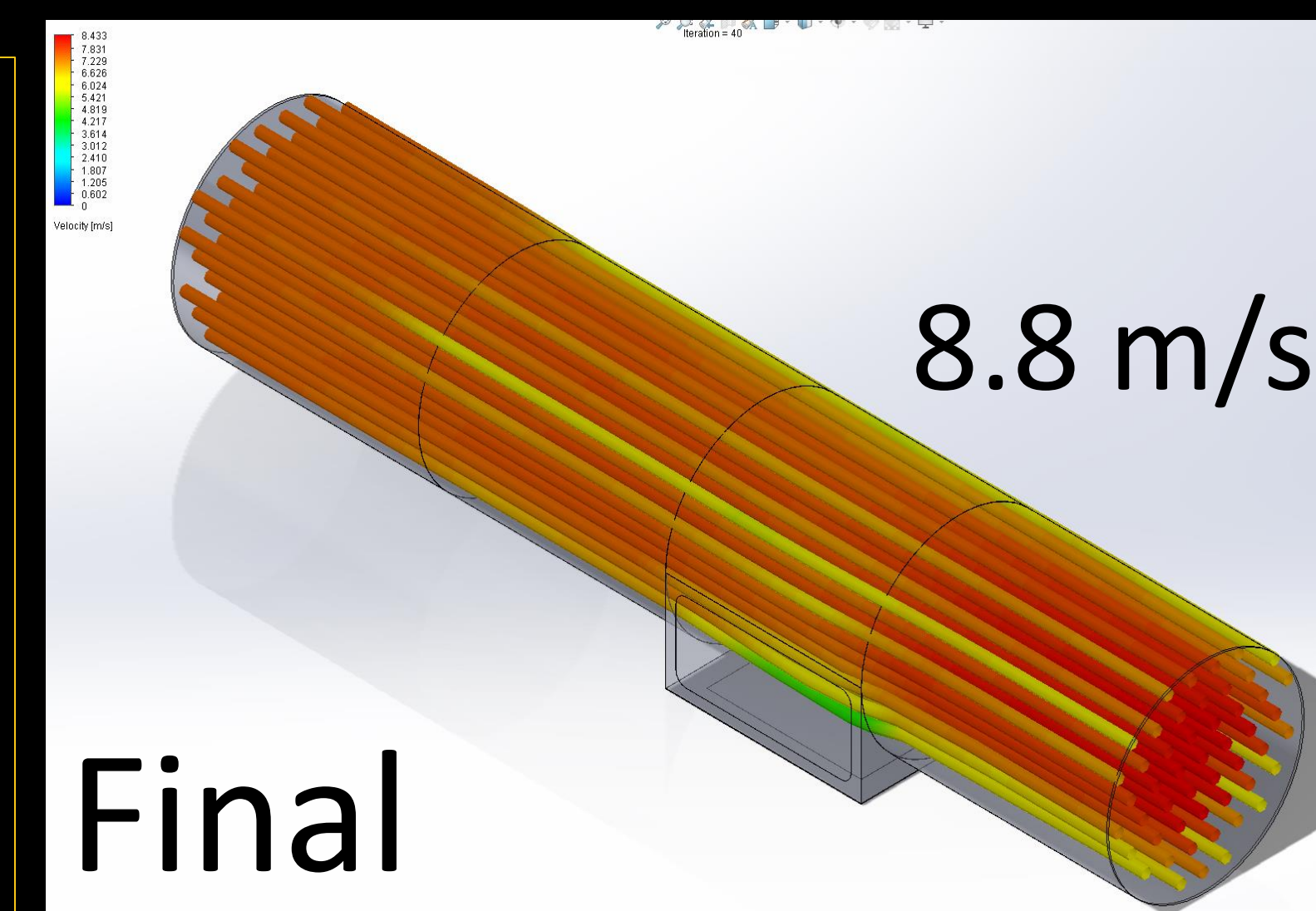
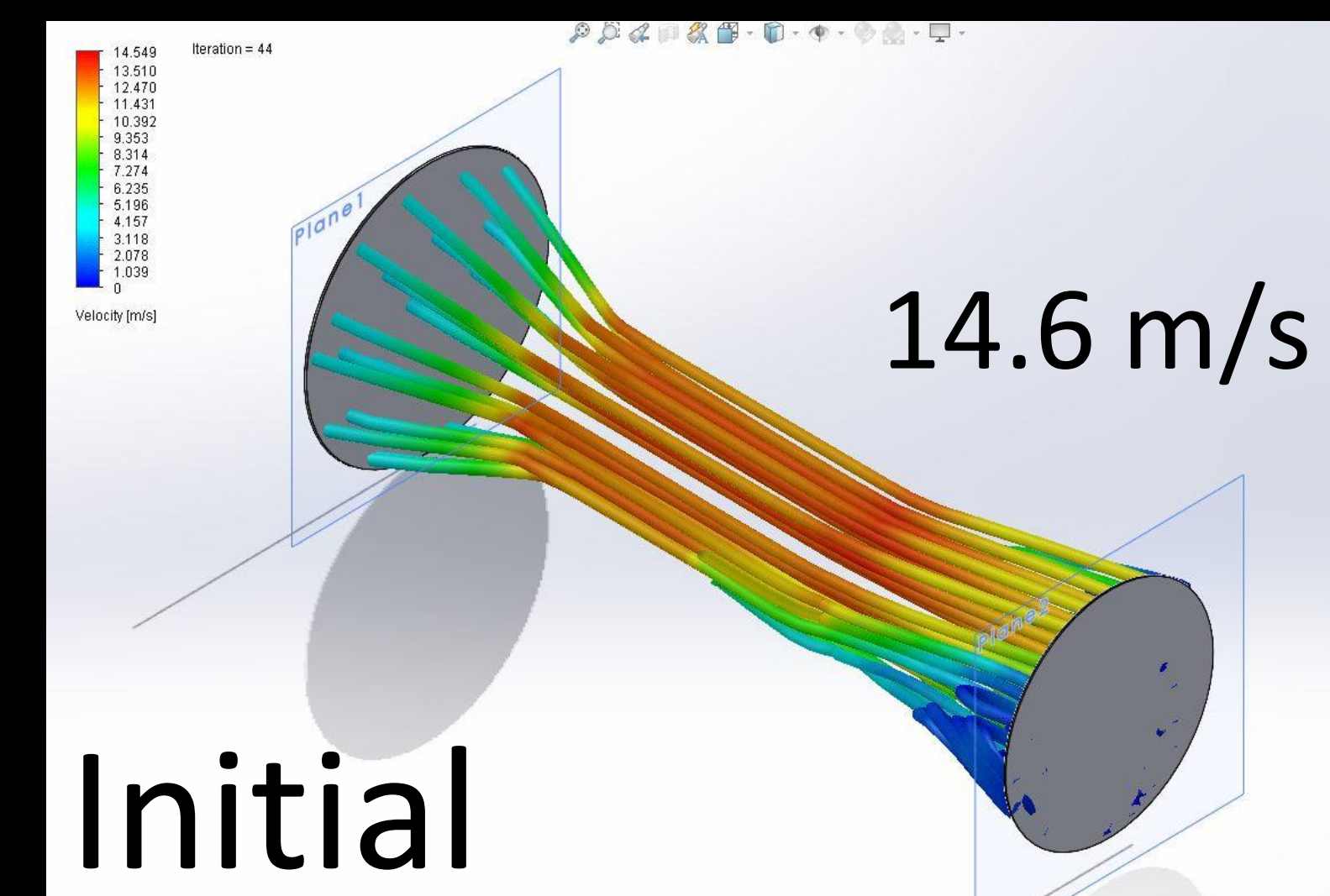
Design 3 (Final): Manufacturable, requires less material

MATERIALS AND SIMULATIONS



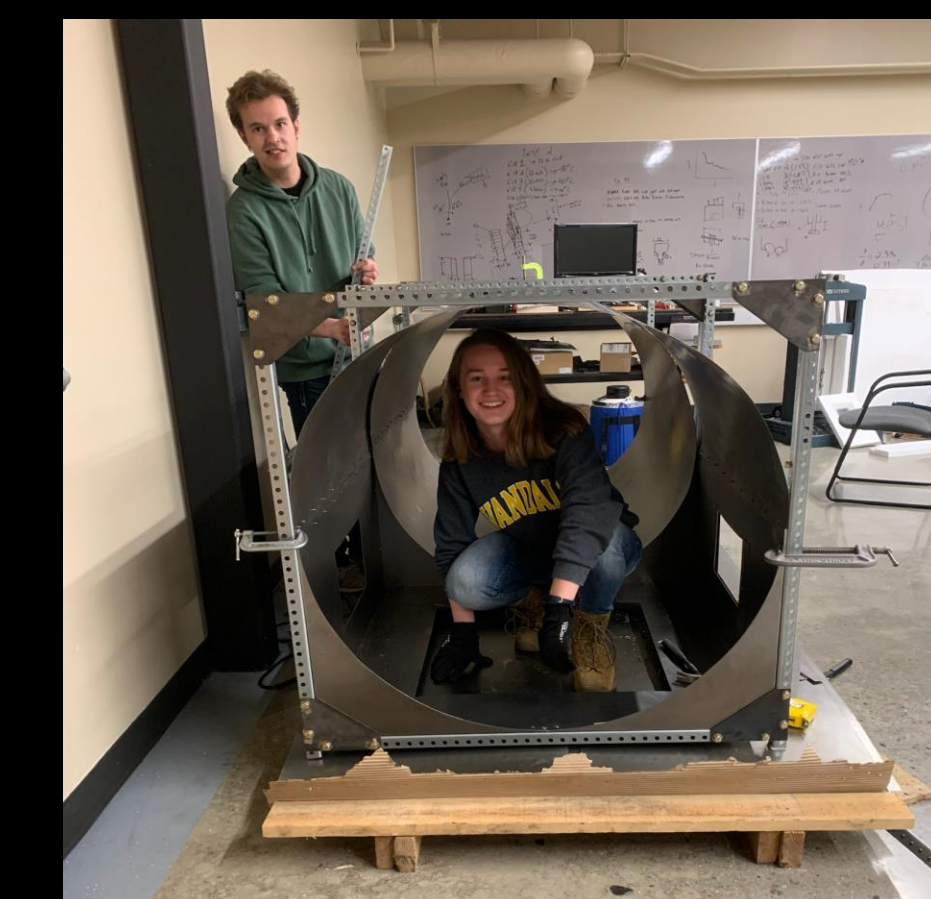
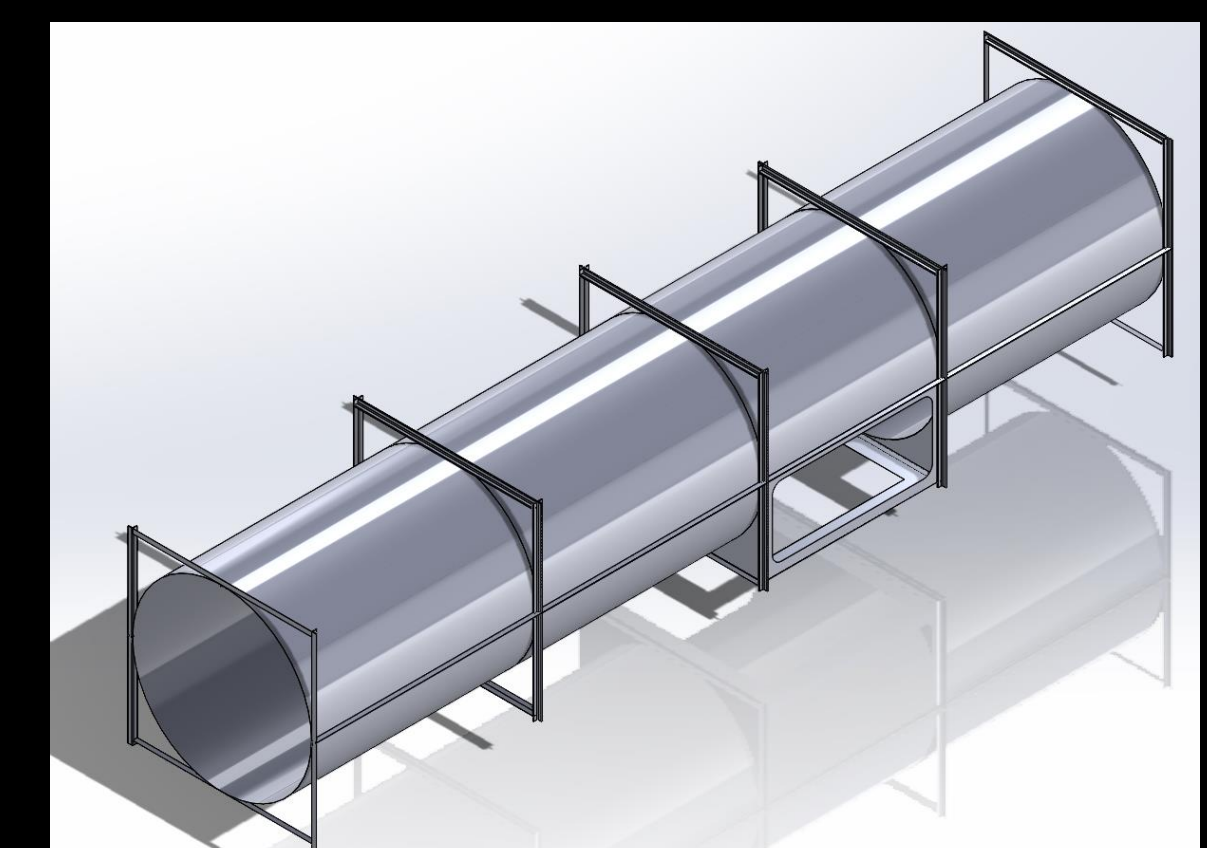
Above: Testing tunnel material using ember generator, left 24G galvanized, right 22G Cold Rolled Steel (chosen material)

Right and Above: Simulations to study test section flow and speed, top image is old design, bottom image final design with straight tube



MANUFACTURING & FINAL DESIGN

Below and Right: Build



Above: Model of Final Design with angle iron frame section connections shown

2-STEP VALIDATION PLAN

Step 1: Run Wind Tunnel

Step 2: Run Wind Tunnel with Ember Generator

RECOMMENDATIONS

Straightening Flow: Integrate multiple screen devices

Measurement Controls: Implemented and Remote

Fan Speed Controls: 5 discrete steps

ACKNOWLEDGMENTS

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