

M1.05 - Post Consumer Recycled Bench

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Background

Alongside previous and future projects, our project aims to establish methods for Texas State University to utilize post-consumer plastic materials, allowing for a reduction in plastic waste.

Problem Statement & Metrics

Problem Statement:

To create a functional seat or bench out of post-consumer recycled plastic.

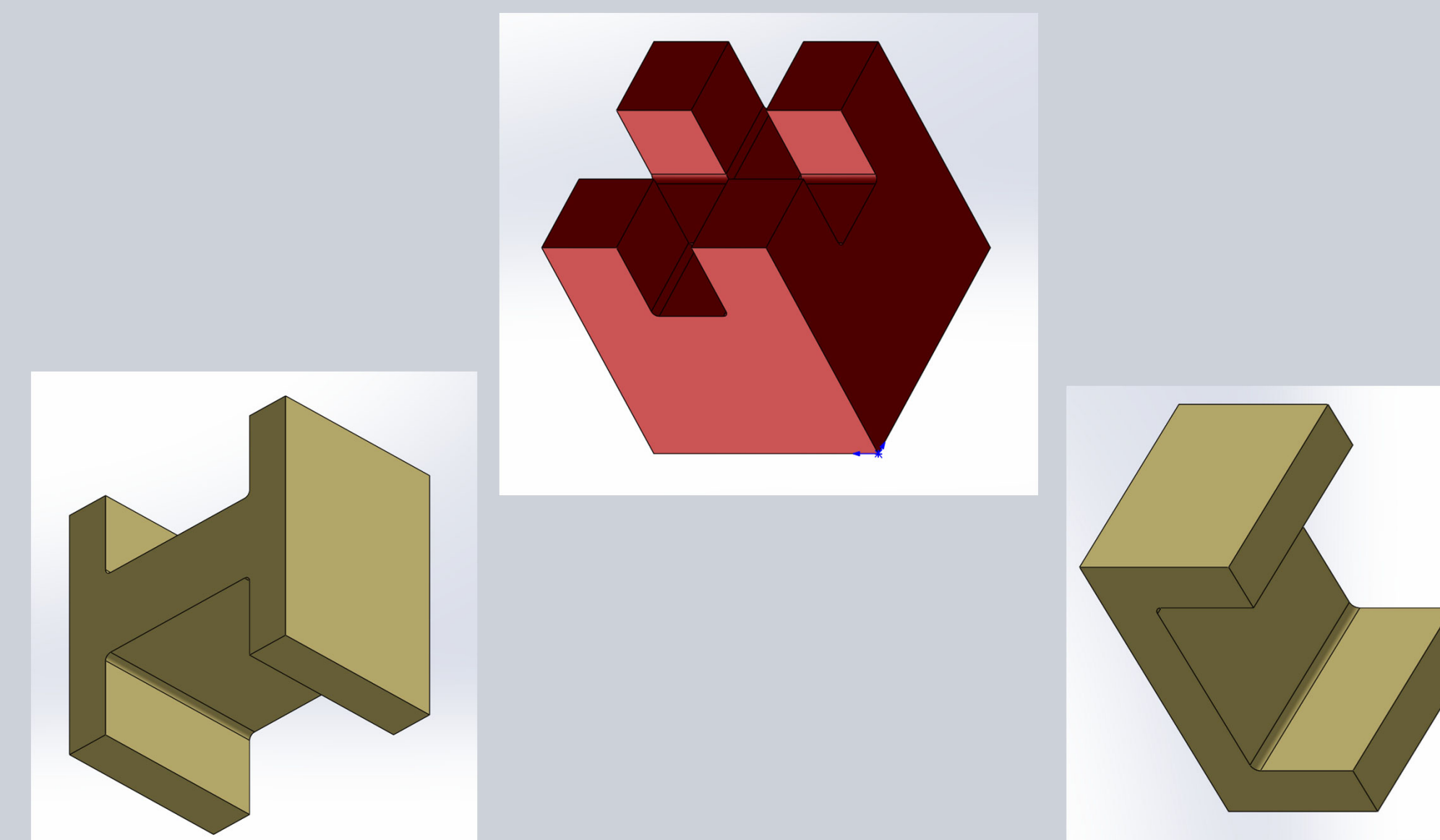
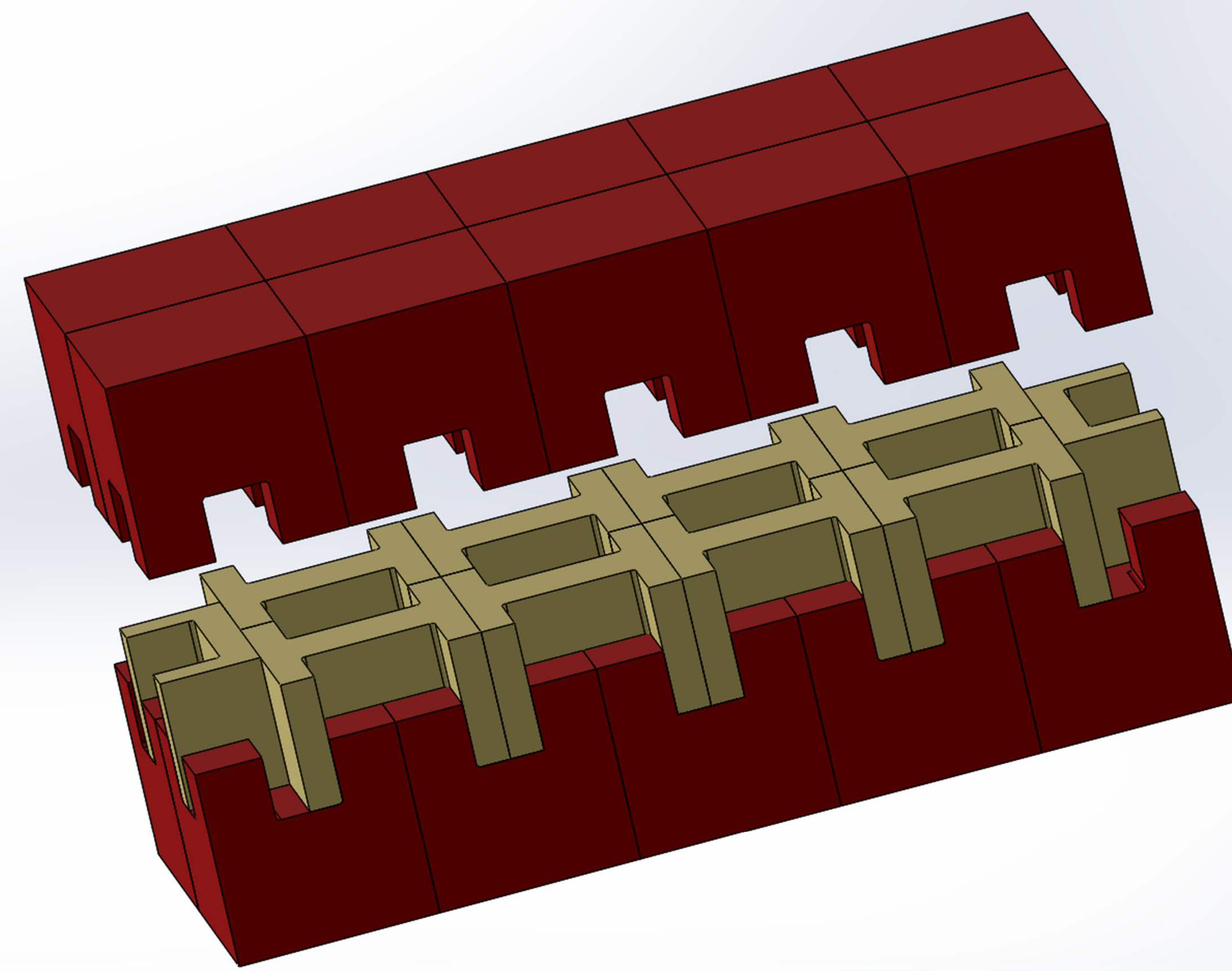
Customer Requirements:

- Incorporates 1 - 3 Texas State inspired details
- Made out 90 % recycled plastic
- Reproducible in under 40 man-hours

ADA Metric Standards:

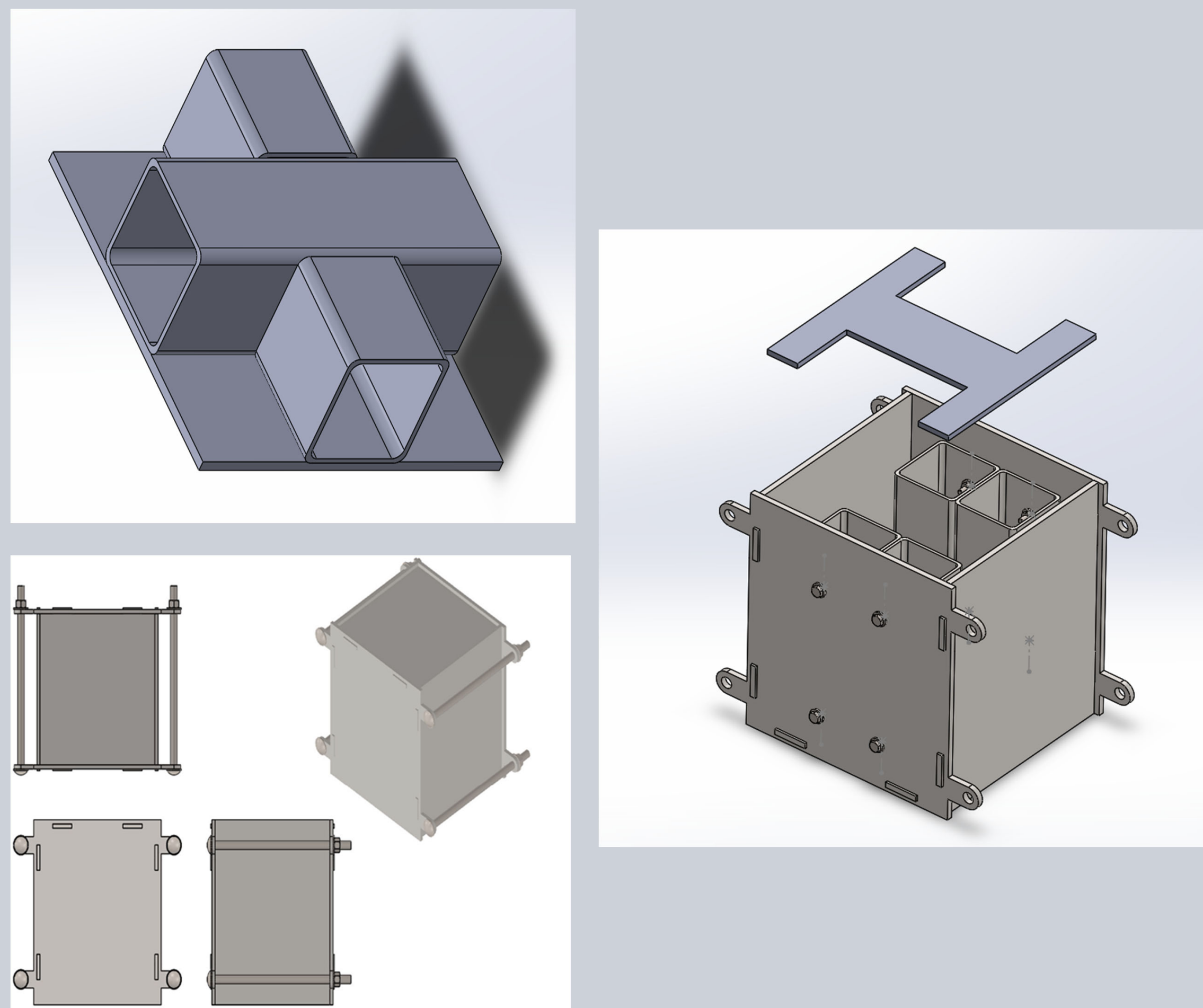
- Length per person : 21" - 26" length
- Depth : 18" - 20" width
- Height : 17" - 19"
- Withstand 250 lbs. of load

Design Process



Concept Selection:

- Bench composed of 30 interlocking blocks.
- Dimensions - 45" L x 18" W x 18" H



1/4 Sheet Stock
11-gauge Tube Stock

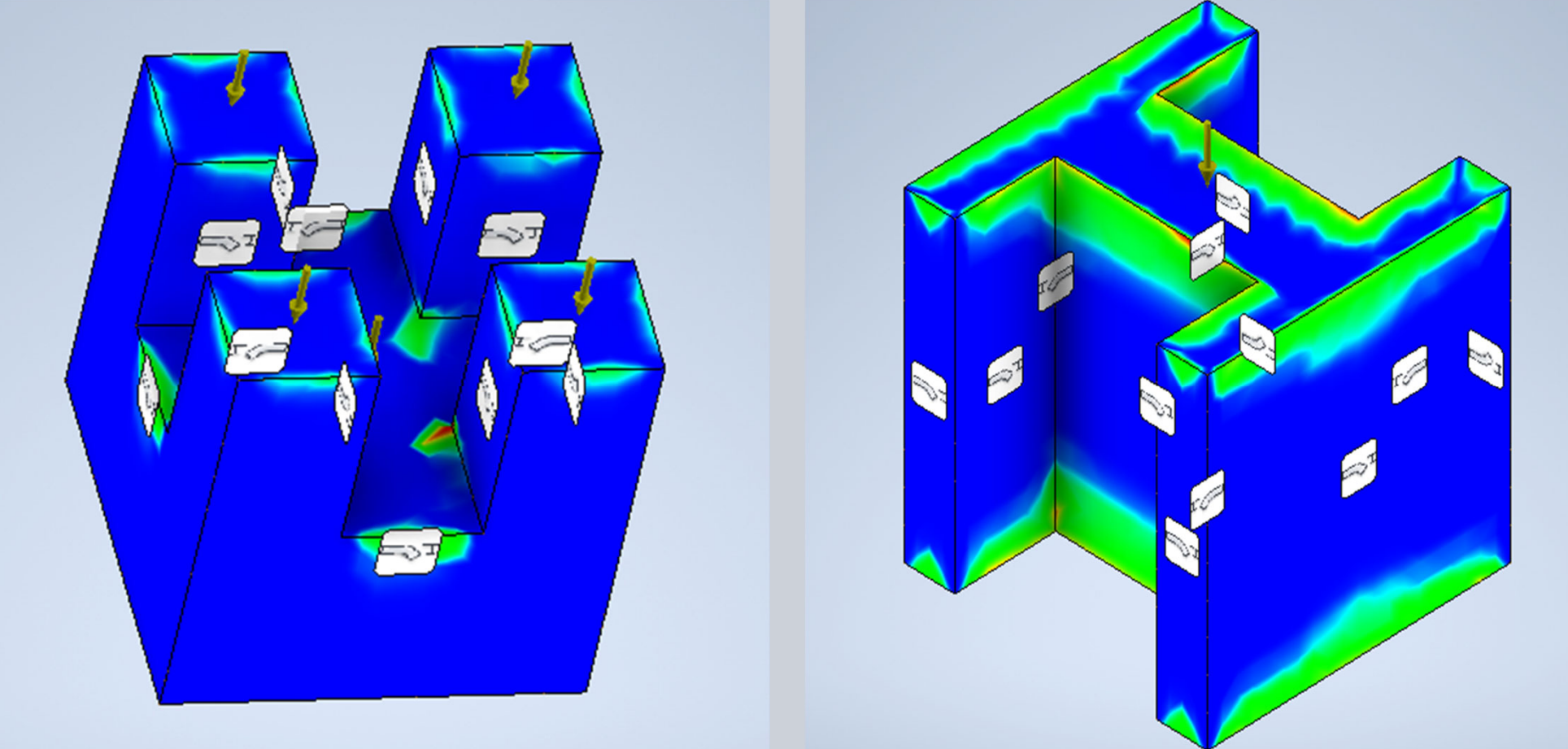
Mold Design: Design accounts for shrinkage, ease of removal, heat conductivity, ease of removal, repeatability, and design flexibility

Processing:

1. Reservoir and compression plate is preheated
2. Reservoir is filled with shredded plastic and placed back in oven
3. Plastic is melted to a malleable state and then removed
4. Compression plate is placed on top of reservoir
5. Hydraulic press is used to press compression mold into reservoir
6. Reservoir is dismantled, and block is popped out

Cost & Stress Analysis

| Material | Parts | Cost |
|-------------------------|---------------------------|--------------|
| 4 ft x 4 ft 1/4" Steel | Reservoir (base of mold) | \$279 |
| 3"x 3" 11 GA 12' length | Stamp (top plate of mold) | \$43 |
| Total | | \$322 |



FMEA analysis demonstrating sufficient load support, with displayed forces applied to blocks

Recycling Efforts

High Density Polyethylene (HDPE)

One of the easiest plastic polymers to recycle, HDPE is a hard plastic often used for:

- Household cleaners
- Milk jugs
- Shampoo Bottles
- Yogurt Containers



Drop-off Station:
Outside the Ingram Hall MakerSpace