B.4 Q6: Select Material Candidates

B.4.1 Platform

The platform required a material that could withstand a minimum yield strength of 200 MPa while providing sufficient rigidity, as a deflection of no more than 1 mm was required at the platform's end. The material also needed to exhibit high corrosion resistance due to the exposure to freshwater environments. Similar to the support arms, a Young's modulus of at least 70 GPa was required, and the material needed to be weldable and easily machinable for efficient manufacturing. Cost considerations also played a role in material selection, as the total project budget was constrained to $150. Aluminum 6061 was selected for the platform, as it met all mechanical and environmental requirements while maintaining a reasonable cost.

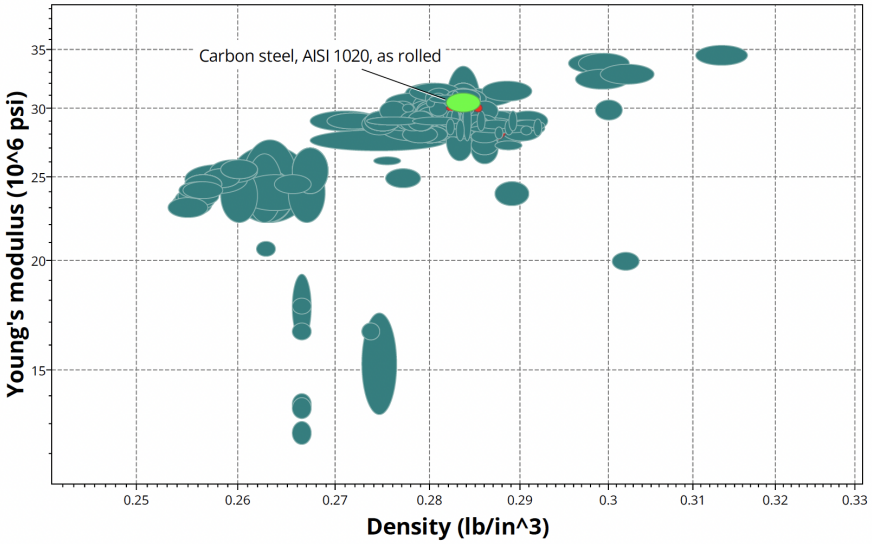


Figure 1: Figure 1: Platform Material Choices

B.4.2 Support Arms

The support arms needed to be made from a metal material with a minimum yield strength of 200 MPa to ensure structural integrity under loading conditions. A Young's modulus of at least 70 GPa was necessary to maintain rigidity while excluding materials such as polymers and magnesium alloys that did not meet strength and manufacturability requirements. The selected material had to be weldable and easily machined to facilitate fabrication. Additionally, corrosion tolerance was a consideration, as the components would be exposed to water. After analyzing multiple material candidates, Aluminum 6061 was chosen due to its balance of strength, corrosion resistance, and ease of manufacturing, while maintaining a low density to minimize weight.

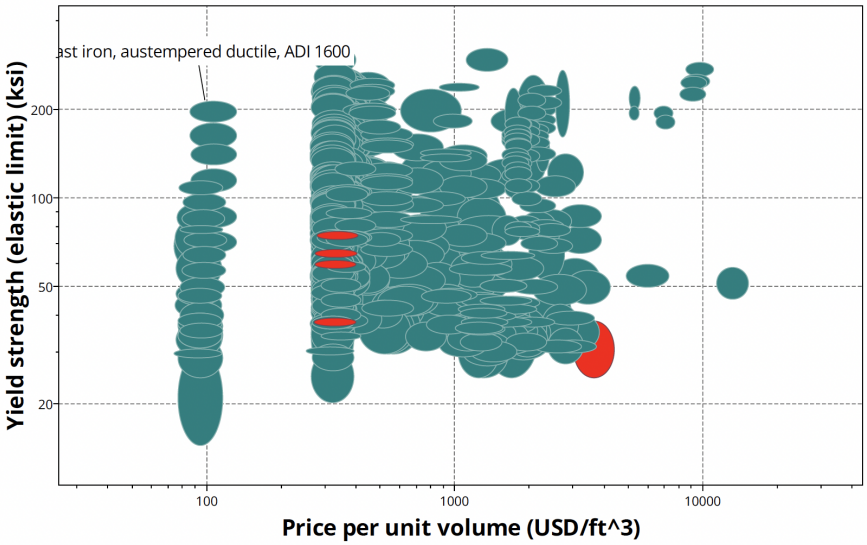


Figure 2: Arms Material Choices

B.4.3 Pins

For the pins, a stronger material was required, with a minimum yield strength exceeding 300 MPa to endure shear and bending forces. Stainless steel was chosen due to its high strength, machinability, and excellent corrosion resistance, making it an ideal material for use in a freshwater-exposed environment. The machining speed of the selected material was considered to ensure it could be shaped safely and efficiently within manufacturing constraints. Through material selection analysis, stainless steel provided the best balance between strength, durability, and manufacturability, ensuring that the pins would maintain structural integrity while preventing premature failure.

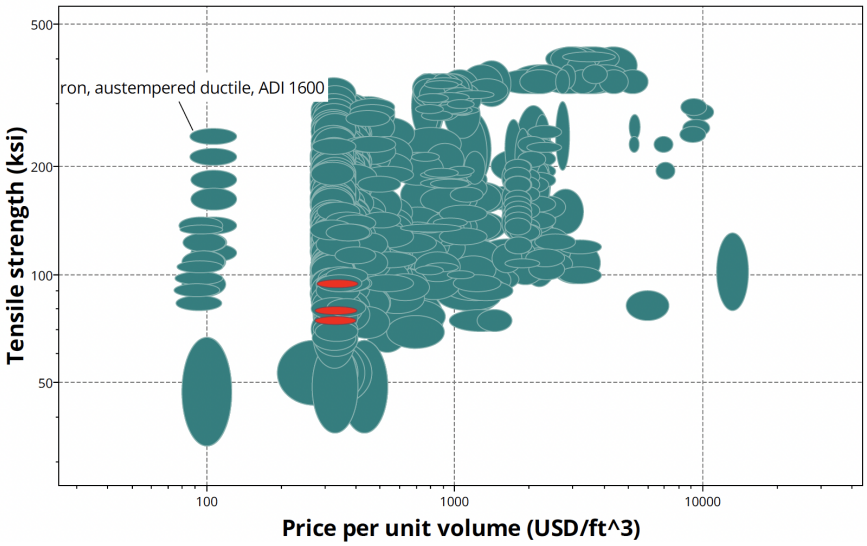


Figure 3: Pins Material Choices

C Design Iteration

C.1 Bill of Materials

Description	Source	P/N	Qty/Package	Package cost	Units	Link
Multipurpose 6061 Aluminum Bar, 1/2" Thick x 6" Wide	McMaster	5679N338	1	$57.33	1	https://www.mcmaster.com/5679N338/
Multipurpose 6061 Aluminum Bar, 1/4" Thick x 1" Wide, 15" Length	McMaster	5679N317	1	$7.65	2	https://www.mcmaster.com/5679N317/
18-8 Stainless Steel Ring-Grip Quick-Release Pin 3/8" Diameter, 1-1/8" Usable Length	McMaster	98404A371	1	$5.40	2	https://www.mcmaster.com/98404A371/
18-8 Stainless Steel Ring-Grip Quick-Release Pin 3/8" Diameter, 1" Usable Length	McMaster	98404A961	1	$4.90	2	https://www.mcmaster.com/98404A961/
Set of 12 3/8-16 x 1-1/2" Hex Head Screw Bolt,Lock Nuts,Flat & Lock Washers Kits,304 Stainless Steel 18-8,Fully Threaded	Amazon	B0DM1MR8Y	12	$12.99	1	https://www.amazon.com/BNUOK-Screw-Washers-Stainless-Threaded/dp/B0DM1MR8YB/
			Total	$106.22		

Figure 4: Bill of Materials