Housing Unit Testing

It is essential that the Smart Mat sanitation housing unit is strong, lightweight, low cost, and will last a long time. To ensure that all of these criteria were properly being met, strength testing and material analysis was done. In order for the box to be both lightweight and sturdy, there needed to be an inner frame and exterior shell or paneling. First a decision matrix was used to determine the initial method of construction and design. The steel frame with aluminum sheeting was deemed the best, with a complete aluminum build coming in at a close second **Figure 1**. Using solid works strength testing feature, a full size steel frame model was tested for tensile and compressive strength under load. It was evident that, based on the results, the box would be able to withstand almost all imaginable forces in a normal classroom setting. The ¾ in steel square tubing could hold well over the 200 and 300 hundred Newtons that were being applied to the top of the tubing. This testing that was done sufficiently proved that the steel frame with aluminum sheeting would be the best material and structure to make the box as strong and lightweight and low cost as possible. **Figure 2**

	Box Design/Materials						Overall Score
	Viability (Financial)	Feasibility	Desirability	Sustainability	Strength		
criteria weighting	*1*	*1*	*1*	*1*	*1*		
Design Options							
Steel Frame With Alluminum Sheeting	2	2	4	5	5		18
Wooden Frame	3	4	2	1	2		12
Complete Polymer Build	4	5	3	2	2		16
Complete Aluminum Build	3	3	3	4	4		17
Criteria Definition:							
Viability (Financial)	How affordable if the product. Does the benefits outweigh the costs?						
Feasibility	How difficult is it to construct the box using this method? Labor Costs?						
Desirability	Will it meet the needs of our stakeholders and will teachers and students actually use it? Weight?						
Sustainability	Will this product last a long time? Will it need maintenance or servicing of parts?						
Strength	Structural integrity, How strong is this design?						

Figure 1 Box Design/Materials

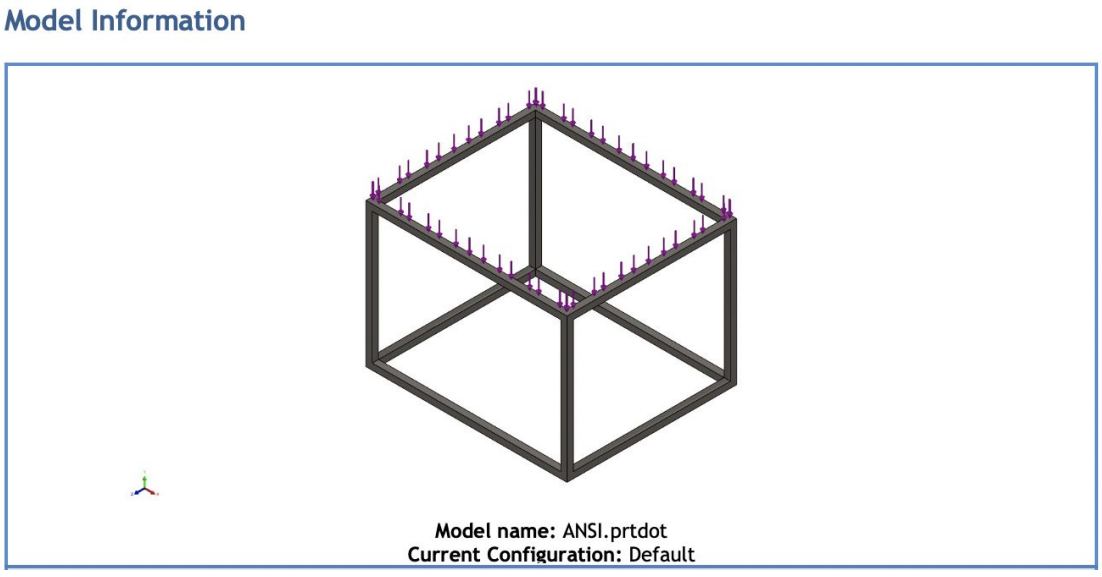

Figure 2 Frame Solid Works Strength Testing