

With the client's preference for a mainly wooden final product, many types of wood and sizes leave a great opportunity to explore different configurations. While being wooden, the construction team decided to explore ways to create a modular and expandable structure with shelves at variable heights. By using easily accessible and standard construction materials from local hardware stores, research and development may occur rapidly allowing more prototyping to occur.

Suggested to use pressure treated cedar, the construction team plans to test alternative options to either reduce weight and/or cost. A reduction in weight for an immobile structure is primarily for safety. In case the structure were to tip over, less weight falling can reduce the chance of severe property damage and/or injury. Additionally, there are concerns about the current method chosen to mount shelves - Everbilt 1-½" corner braces - may not be able to hold the desired weight. Should the weight on the braces exceed the maximum, damage and instability to the product could occur.

In the first prototyping session, non-pressure treated cedar will be used to create one of the shelving units to compare against pressure treated cedar. This shelf will then be mounted onto 4 Everbilt 1-½" corner braces, in the same configuration as if it were a segment from the final product, and loaded with weight. First in the center to understand the maximum load capacity of the shelves, then secondly along the edges of the shelf to simulate a person climbing or standing on the unit. These two tests will help identify points of failure that should be revised.

Test Plan:

1. Construct a 1:1 shelf, replacing all pressure treated cedar with regular cedar.
2. Analyze the prototype. Identify characteristics of the choice of wood to understand the benefits and downsides compared to pressure treated cedar.
3. Mount the prototype shelf onto four 4"x4' vertical blocks with Everbilt 1-½" corner braces fixed to a flat board to replicate a segment of the final product.
4. Begin applying weight evenly on top of the shelf until failure or approximately 980N of force is applied. Assess the prototype for damage and deformation.
5. Unload the weight.
6. If there is damage, repair the components and save the damaged parts for further assessment.
7. Repeat steps 4 to 6 for all four sides of the shelf by loading the weight on top of the walls.