Optimus Modular Table

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Abstract

The average 1 bedroom apartment in New York City is 750 square feet [1]. This restricted amount of living space limits the amount of furniture one can fit. Thus, having a table that can be adjusted to serve multiple purposes can be very valuable. The goal of this project was to create a table that could be reconfigured for a variety of different situations.

Figure 1: Optimus Table Prototype

Design Objectives

Objectives were identified through team discussions. Design features were then prioritized based on what we determined were the most critical from the consumer's perspective. The following list prioritizes features:

1. Configurable Shape (Easy to Adjust)
2. Adjustable Height
3. Minimal Tools Needed for Assembly
4. Removable Legs

Table 1: Design Performance Requirements

Configurations	Stand alone unit, L-shape, Square
Height Adjustment	17 or 28 inches
Weight of Single Grid	10 lbs
Tools Needed for Adjustments	1
Time Needed for Adjustments	2.5 minutes

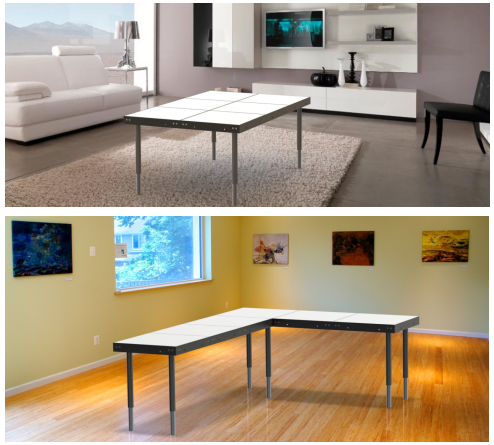

Figure 2: Solidworks model of Optimus Table

Design and Development

The biggest challenge we faced was designing a grid-locking mechanism that would both compress and align the grids together to reduce the amount of legs necessary for stability. This way the six grids in the rectangle configuration as shown in Figure 4 would only need four legs. The final design incorporated bolts and wing nuts which proved to be strong, cost-effective, and ergonomic. The steps to assembly using the locking mechanism are shown below.

Figure 3: Assembly Steps to Lock Grids

Testing and Analysis

To test the locking mechanism, two aluminum plates were compressed using the bolt/wingnut combination. These plates were then subjected to a pry test to measure displacement for various bolt sizes. It was determined that a 3/8 inch bolt would provide sufficient compression. To validate our final design, an FEA test was conducted to determine the deformation of the tabletop under typical loads. Figure 4 shows the strain results from a 100 lb. load. The strain experienced at the center of the table was 1.23×10^{-4}.

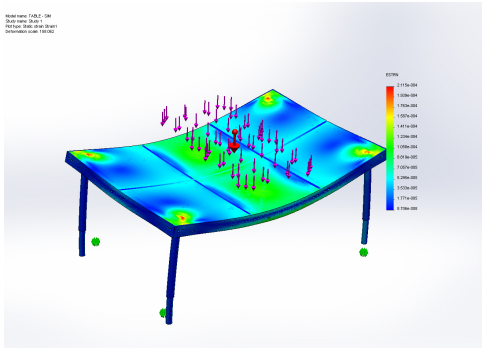

Figure 4: Strain Graph Results from FEA Testing

Conclusion

Through prototype testing and Solidworks analysis, our product design has proven its ability to satisfy all the design objectives we set out for. In addition to allowing for several configurations and heights, it provides a sturdy, high weight-bearing surface, and is very easy to adjust. Our team's efforts have produced a table that we can proudly say achieved all the criteria we established at the start.

Acknowledgements

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References

[1] *One Bedroom Apartments in NYC*. Naked Apartments. 3 June 2014. Web. http://www.nakedapartments.com/nyc/one-bedroom-apartments-nyc