Creative Sustainability

Designed and Built by: Kevin Louth

Concept: Why So Angular?

Cardboard is an amazing material. It is common, easy to produce, sturdy if used correctly, and extremely versatile. This project was my attempt to combine the themes of environmental awareness and aesthetic design. “Recycling” entails so much more than tossing spent material in a green bin labeled with an infamous triangular mesh of arrows. More broadly, recycling is any form of material reuse. Interestingly enough, recycling can yield creative results, like this table.

Inspiration: Why So Unique?

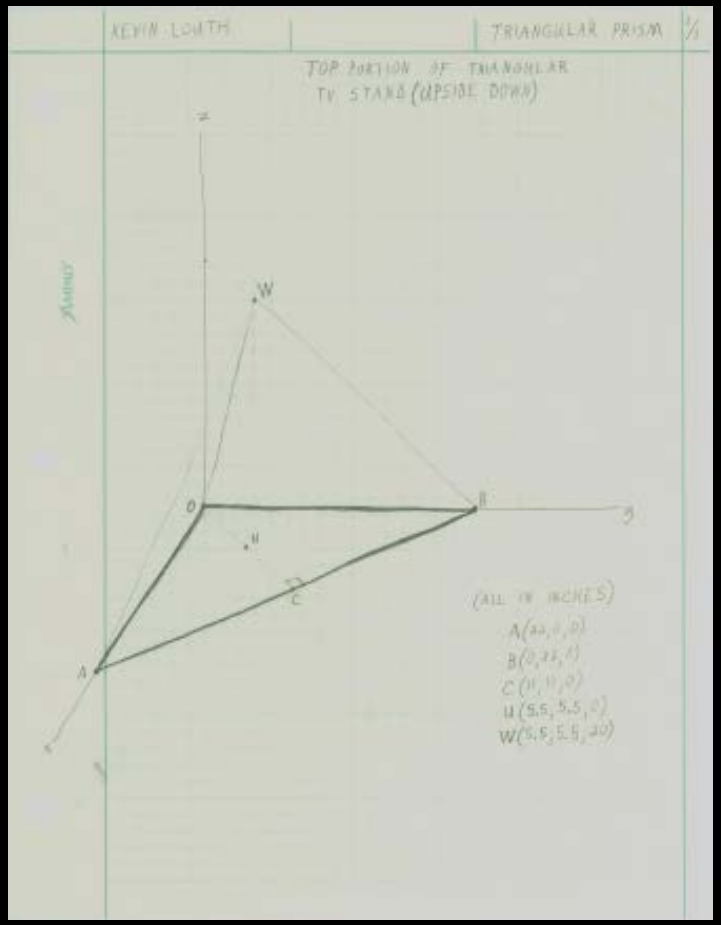
I formed the idea for this table in light of my college dorm room's lack of furniture, and after I saw a large flat-screen TV box on the brink of disposal. I immediately seized said box and brought it to my room. Ironically, it was befitting that this repurposed TV box supported my own TV, shown on the left.

The original plan for this table was to be an abstract representation of an hourglass. As I mentally constructed the table, I thought how simple it would be to build 2 identical tetrahedrons, one being an inversion of the other, and join them together at their points.

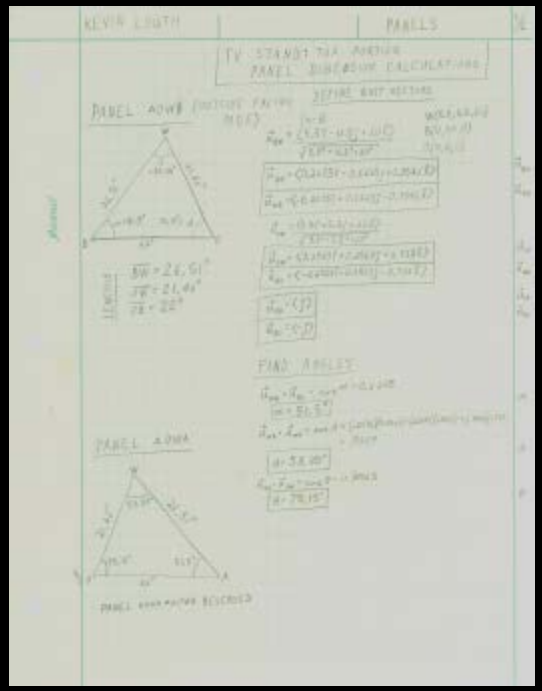
The design then became more complicated in various respects…

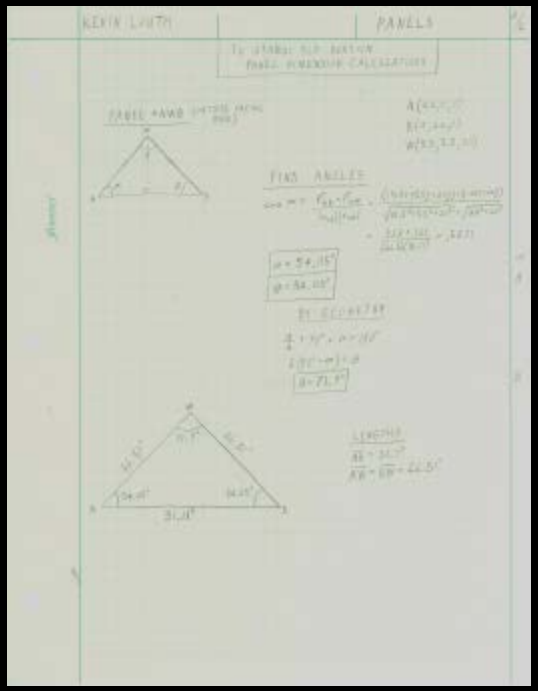
Design

At the time of this table's construction, I was enrolled in a statics course. Before taking this course, I had no idea of how to calculate angles in anything other than 2-dimensional planar space. Up until statics, unit vectors were an abstract idea that only loosely related to subjects like physics and calculus. But using them for 3-dimensional angular calculations sparked that infamous incandescent above my head. Unit vectors gave me a method by which I could dimension my otherwise very general table designs.



Tetrahedron vertices plotted: Directional unit vectors calculated from these desired points

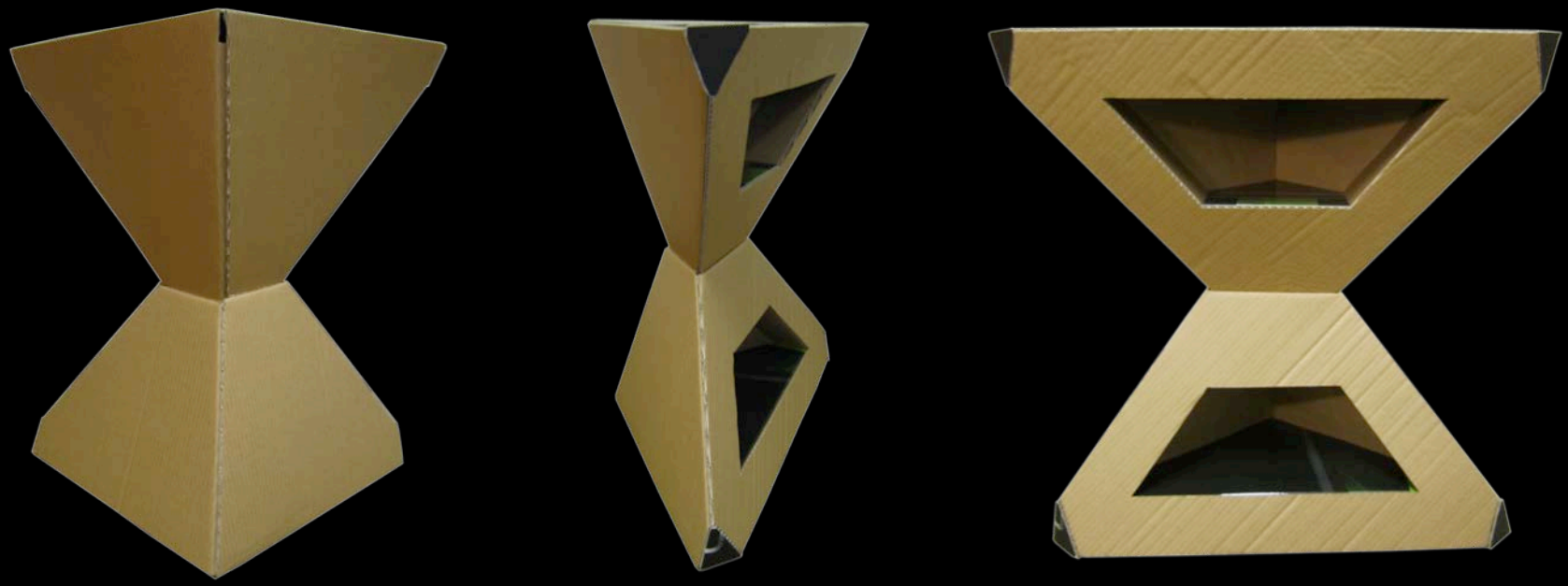




Angles/Dimensions calculated: using dot product identity unit vectors, found dimensions and angles for panels of one tetrahedron. Second tetrahedron exactly symmetrical to first.

Design (continued…)

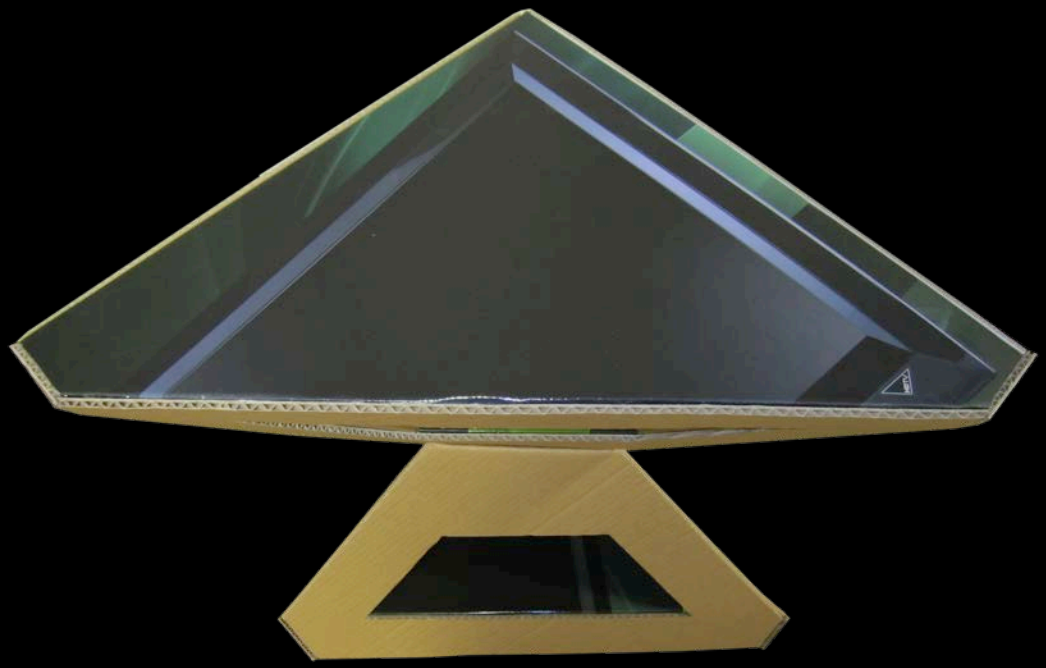
Though my main goal was to spur wonder and visual appeal, function was just as important as form. After all, what good is a table that you can't put anything on? To make the table least likely to tip or break in the middle, I fashioned the joint between the top and bottom tetrahedrons to be directly below the center of the triangular table surface (seen from sketched diagram of plotted vertices), thereby minimizing the maximum moment exerted on the table (i.e. if somebody placed a heavy object on one corner of the surface, the average moment or torque exerted by gravity would be minimized). This is also important for the dead load of the table (e.g. a television), because the constant application of even a small moment could topple the structure.

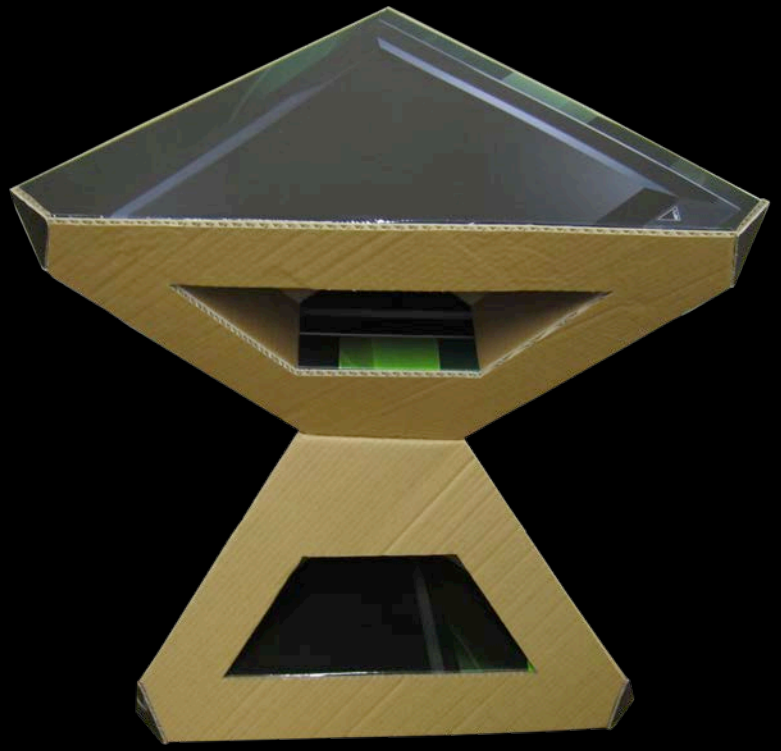


Symmetry: These show a semi-rotational view of the table, its symmetry about the horizontal and front facing vertical axis, and how the mid-joint lies directly below the middle of the top surface for structural stability.

Design (continued…)

The surface of this table is colored and slightly waxy partly for aesthetics, but mainly as a primitive waterproofing. The surface is most likely to get accidentally wetted, and this slight waxiness gives the spiller enough time to dry the spill, whereas if the surface were bare cardboard, the spiller would be going dumpster diving for fresh replacement cardboard, as he/she would have just decimated the integrity of my table.

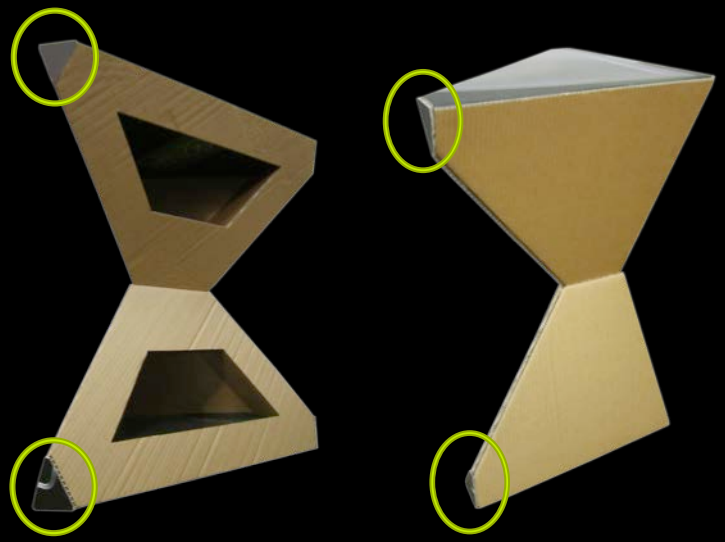




Waxy Surface: Using the natural sheen from the exterior of the TV box, I made a primitive waterproof surface.

Design Tweaking

I decided to lop off the sharper corners of the table and flatten them, as gradual wear would have done for me anyway, but in a more destructive manner. I also decided to add shelving to break up the monotony that was the plain original table front. After building the shelves by hand (no calculated designs), I realized they actually contributed to the stability of the table, because they reduced the chance of the front (largest) face from buckling. In effect, they increased the moment of area to a degree that could only be surpassed by the cardboard ripping, and I don't foresee that happening anytime soon.



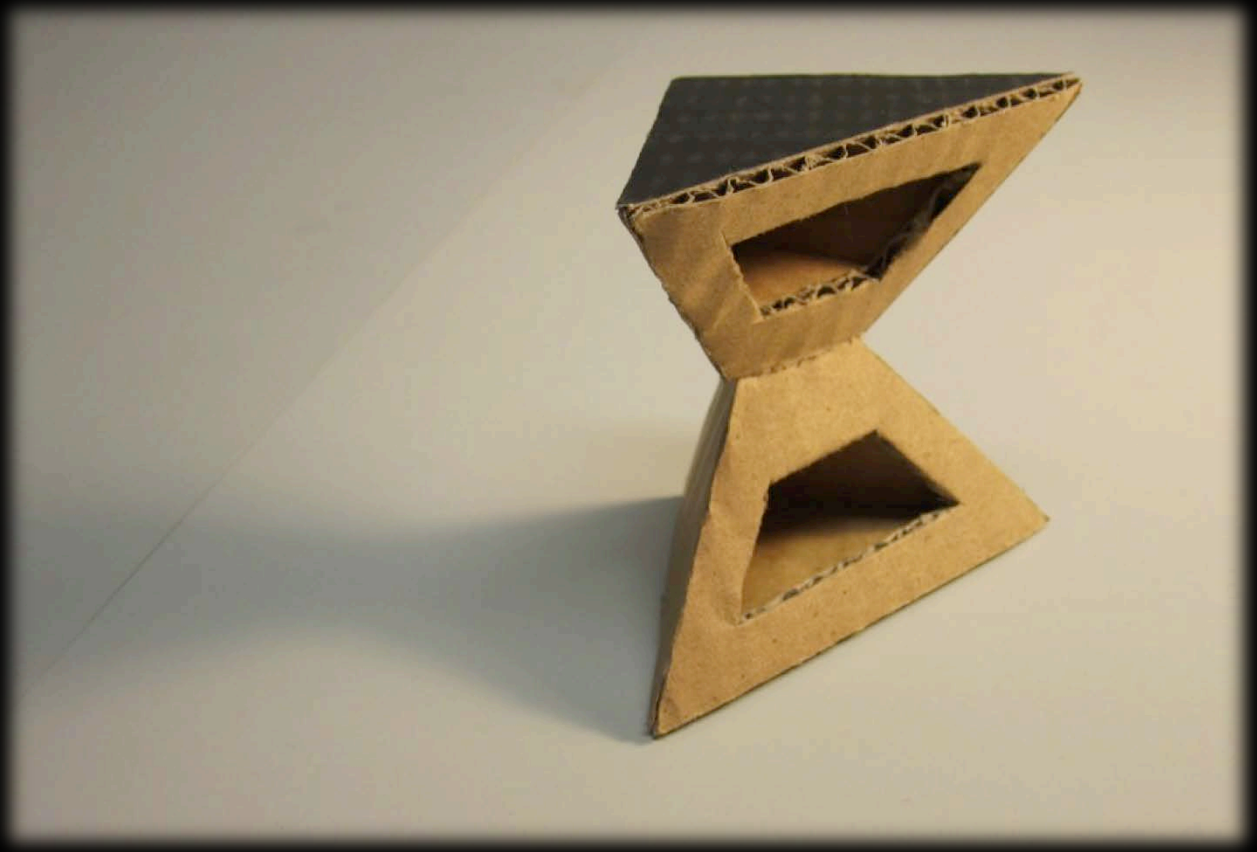
Dull Corners: Lopped off corners highlighted green

Shelving: Close-up of top shelving unit showing precision of cuts and craftsmanship

Completion Comments

The finished product is extremely light, though bulky and easily banged. The most fragile point is the joint between the two tetrahedrons, but that is only a concern during transport, because downward weight during normal use is compressive and doesn't contribute to tensile stress on the joint.

I hope this project will be inspiration for other people to think outside of the box (literally) and form innovative solutions regarding recycling.



Model: Ironically, built after completion of full-size table