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Perpetual Calendar

OBJECTIVE

Create a calendar that conveys information without using the standard calendar format.

RESEARCH

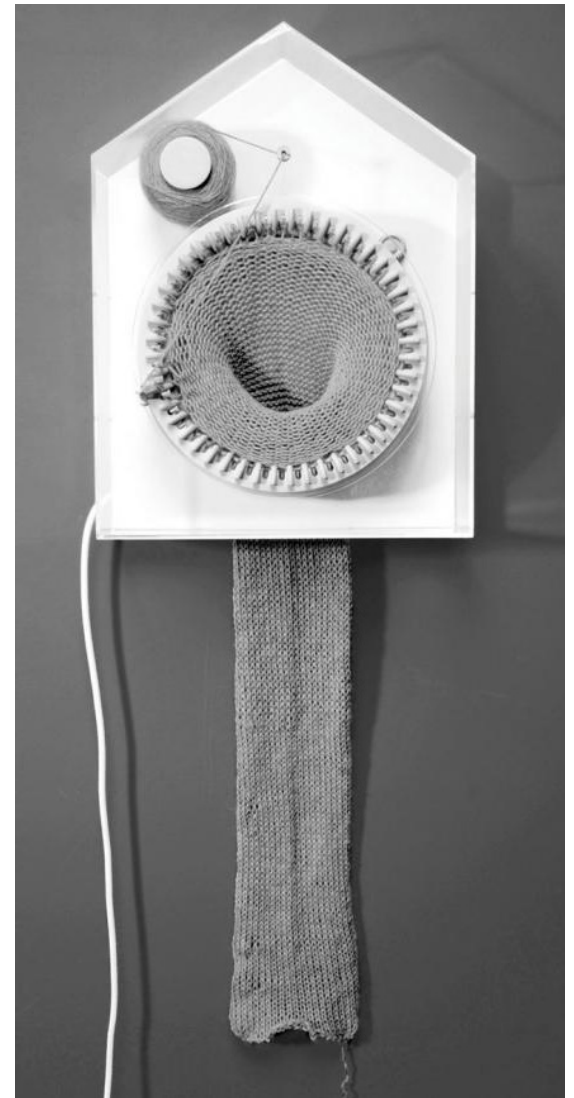
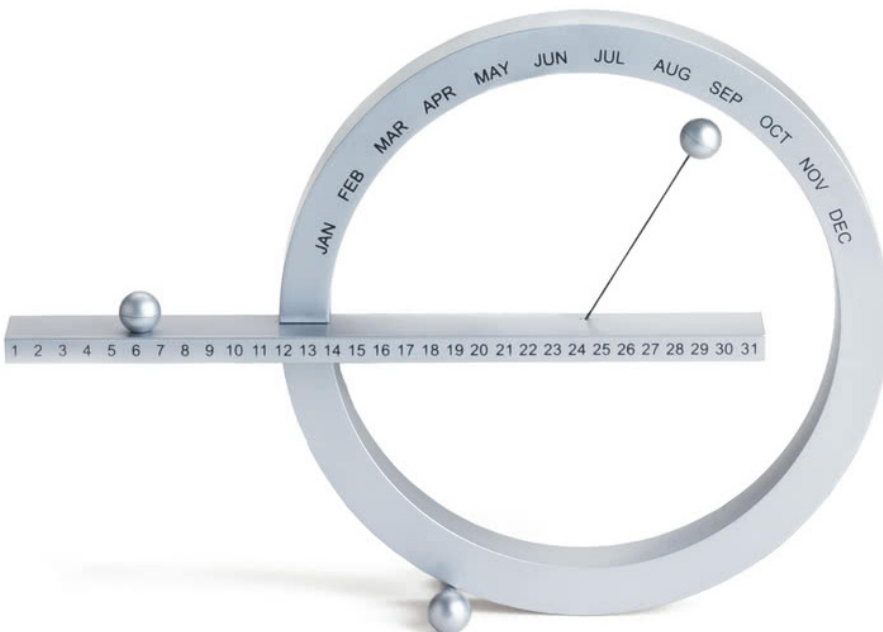


Image Sources:

<http://www.sebastianbergne.com/product/monthly-measure/>

<https://www.connox.com/categories/stationery/calendars/moma-collection-perpetual-calendar.html>

<https://odditmall.com/scarf-knitting-clock>

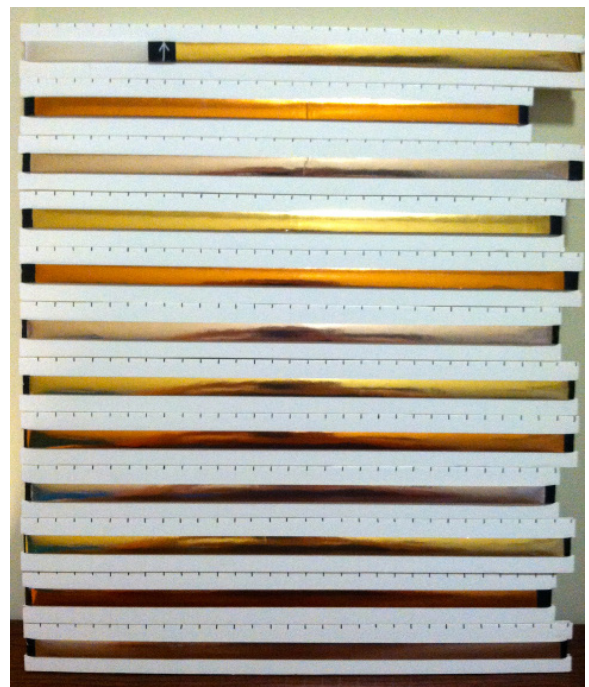
FINAL DESIGN

Of all the clocks that I researched, I was most inspired by the ones that conveyed time in a linear way, so I decided to create an interactive calendar that would show the passage of time graphically. Each row had a metallic ribbon on the front, and a white ribbon on the back.



assembly process (back view)

All Metallic = 1/1/13
1 Tick Mark = 1 Day
1 Row = 1 Month
All White = 12/31/13



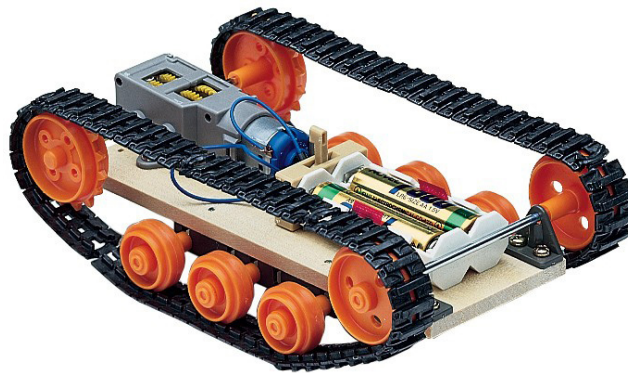
final product

OBJECTIVE

Design and construct a vehicle that can climb an 11" wide "hill" under its own power, stop at the top of the hill, and defend its position against an opposing vehicle coming up from the other side of the hill.

BASIC DESIGN

Each team was given the "Tamiya 70108 Tracked Vehicle Chassis Kit". The assembled vehicle would look like this:



However, this vehicle didn't have a defense mechanism, and wouldn't be able to sense that it was at the top of the hill and needed to stop. We knew that we needed to add additional features in order for our vehicle to succeed in the competition.

DEFENSE MECHANISM BRAINSTORMING

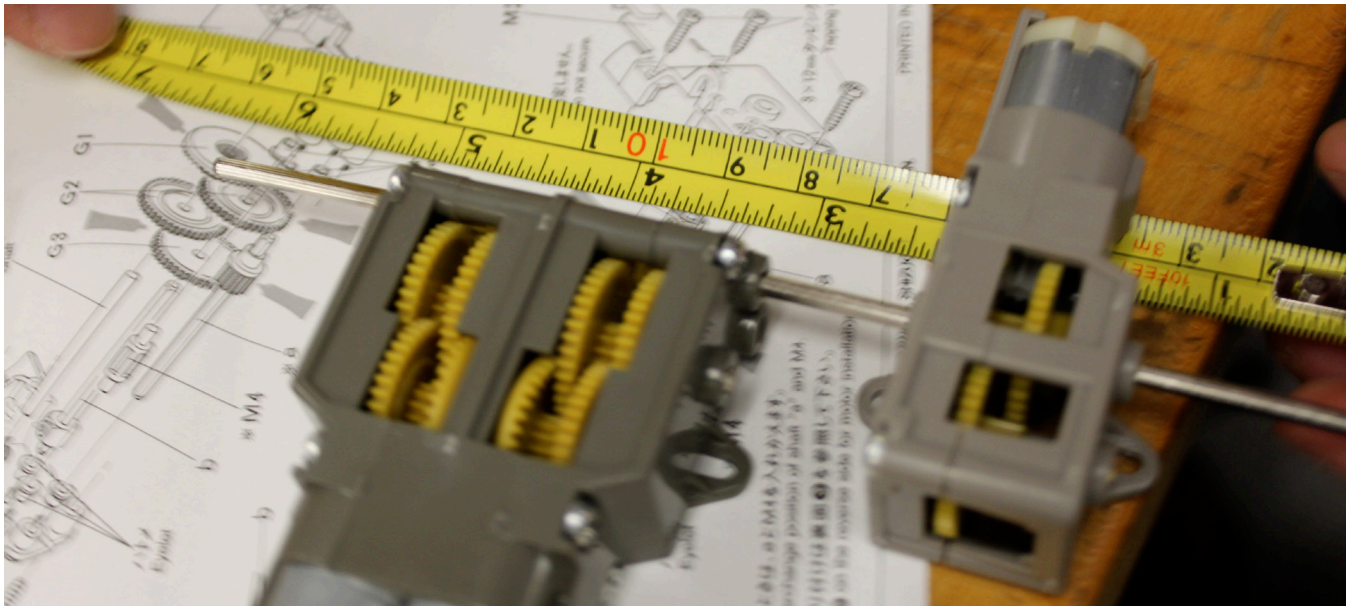
bulldozer *spinning metal plate*

*launch marbles to attack
the opposing vehicle* *11" width*

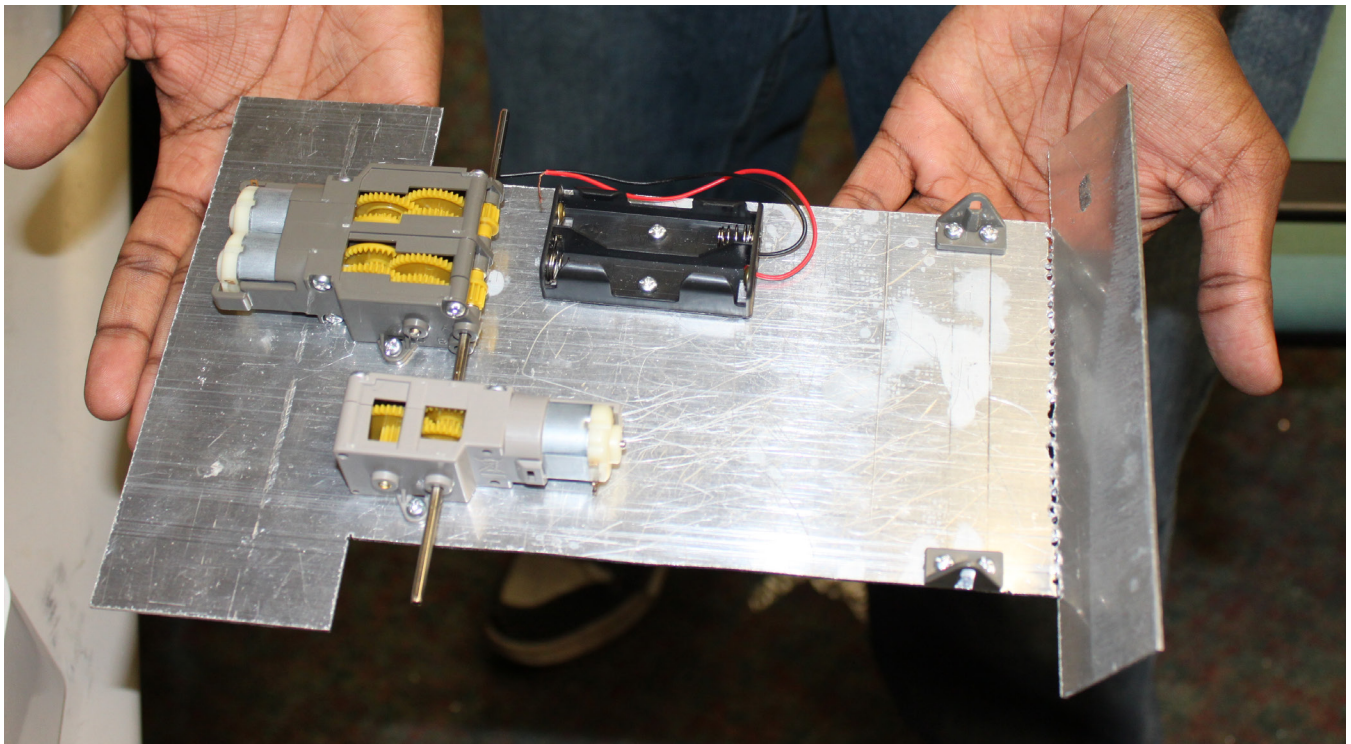
DESIGN DECISIONS

Design Feature	Rationale
11" width	Opposing vehicle has no room to get past, and our vehicle won't need corrective/steering device ("hill" is 11" wide)
Tilt sensor	Vehicle recognizes the top of the hill and therefore knows when to stop
Bulldozer	Simpler to construct than a trebuchet or spinning metal disk
Extra gear box	Adds torque to help the vehicle reach the top of the hill
Sheet metal base	Protect motors and wiring

ASSEMBLY

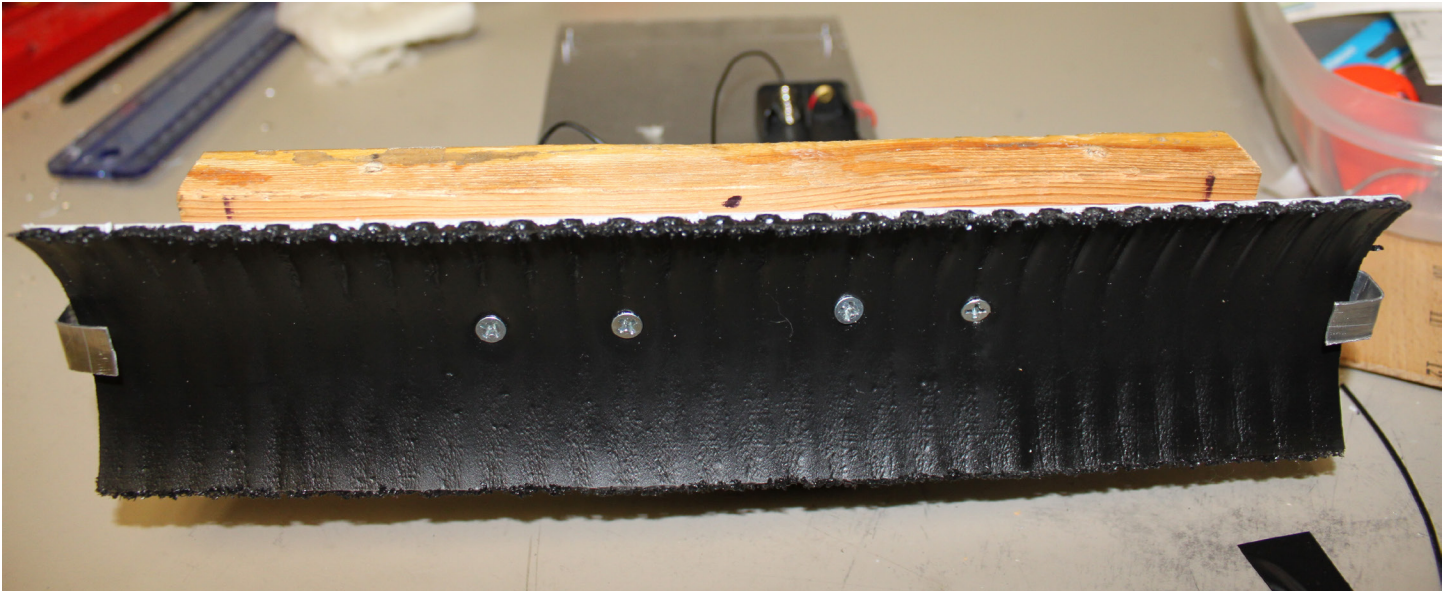


We added an additional gear box, for a total of three motors.



We built a new base out of metal, because the existing wooden base wasn't sturdy enough to hold the bulldozer.

RESULTS



the final car design

Despite troubleshooting beforehand, our vehicle did not perform well in the competition.

The weight of the bulldozer created so much friction with the bridge surface that our vehicle could barely make it up the hill. In addition, the treads of the vehicle did not stay taut.

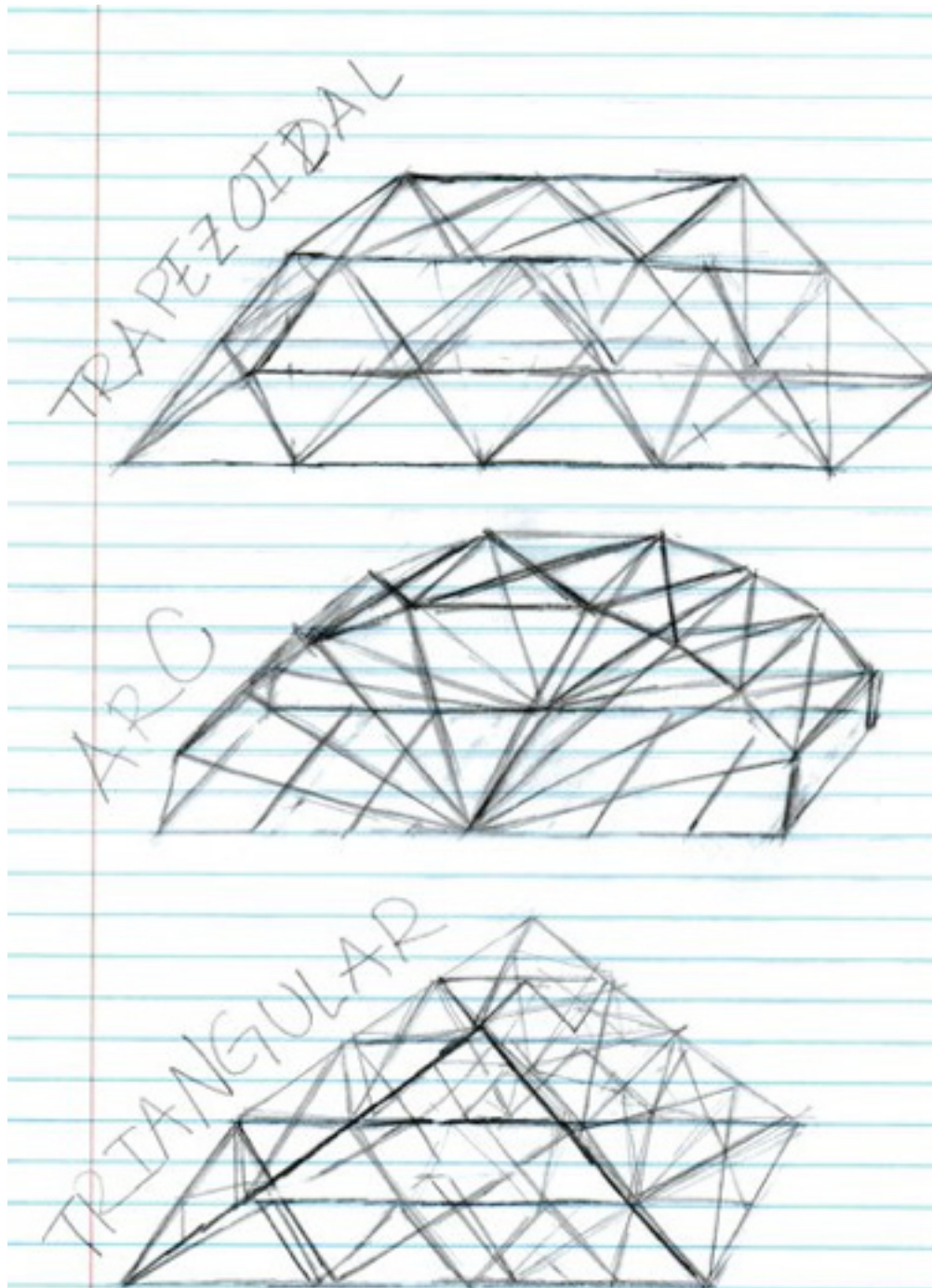
If we could do it again, we would have designed a lighter bulldozer and enhanced the chassis design to ensure that our vehicle could maintain traction and support its own weight in order to make it up the hill.

Spaghetti Bridge

OBJECTIVE

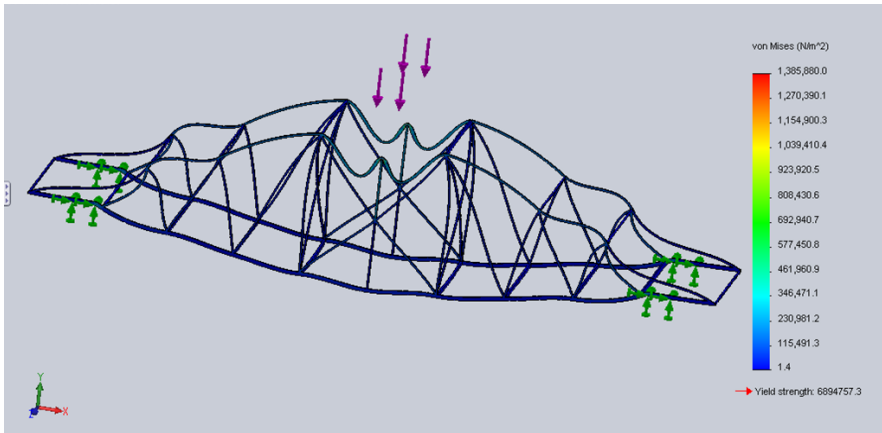
Construct a bridge that weighs .5 lbs. or less and holds the maximum amount of weight.

PRELIMINARY SKETCHES



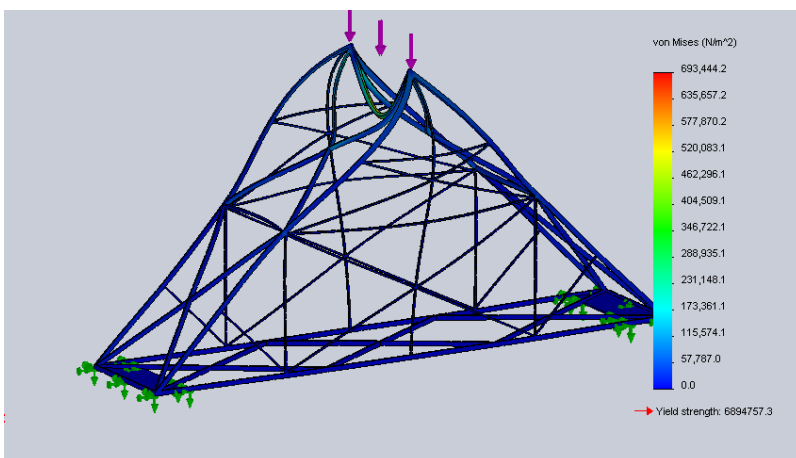
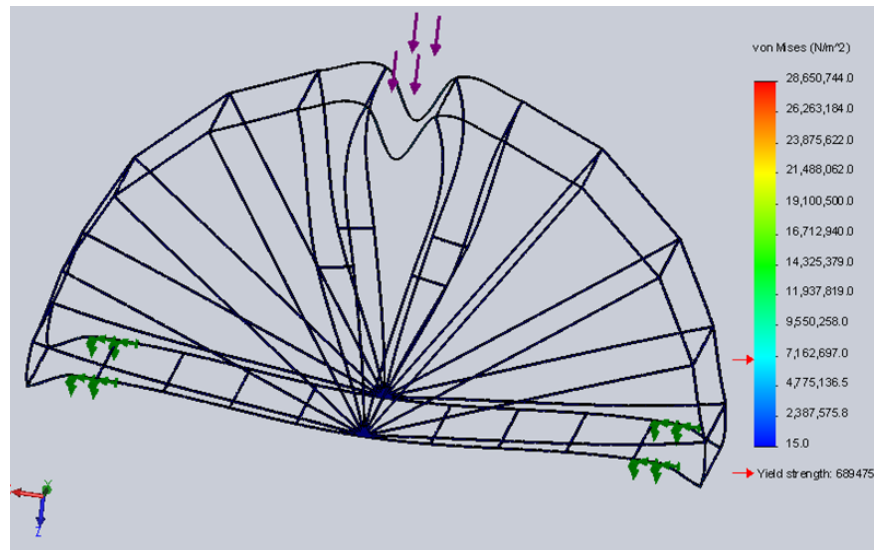
SOLIDWORKS TESTING

We tested each design in SolidWorks to determine which one was the strongest.



Model #3 – Truss
Factor of Safety – 3.17
Force – 1 Newton

Model #2 – Arc
Factor of Safety – .24
Force – 1 Newton



Model #1 – Triangle
Factor of Safety – 9.94277
Force – 1 Newton

SPAGHETTI + GLUE TESTING

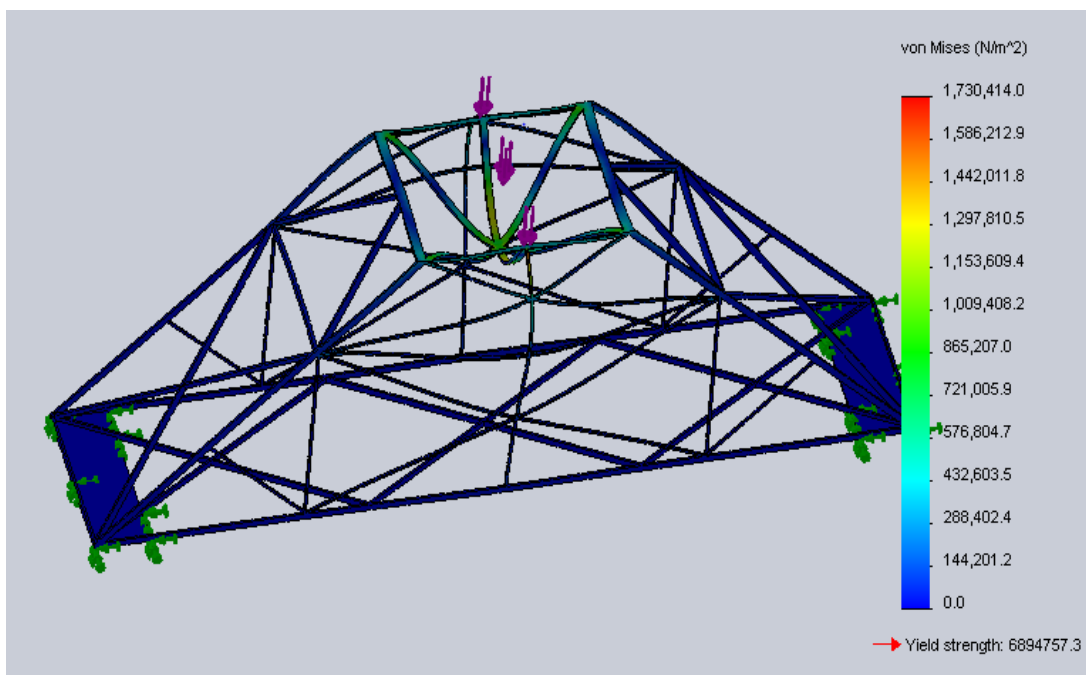
We used point load testing to determine the strongest brand of spaghetti.

We also determined that spot gluing (vs. full length gluing or lamination) was the most effective gluing method.



FINAL DESIGN

We chose to build the triangle because it had the highest factor of safety of the original three models. However, we wanted the dowel (which would be supporting the weight during the contest) to rest on the top of our bridge, and not on the base. Therefore, we cut off the top of the triangular SolidWorks model to make it into a trapezoid, which allowed for a flat surface on top for the dowel to rest on.

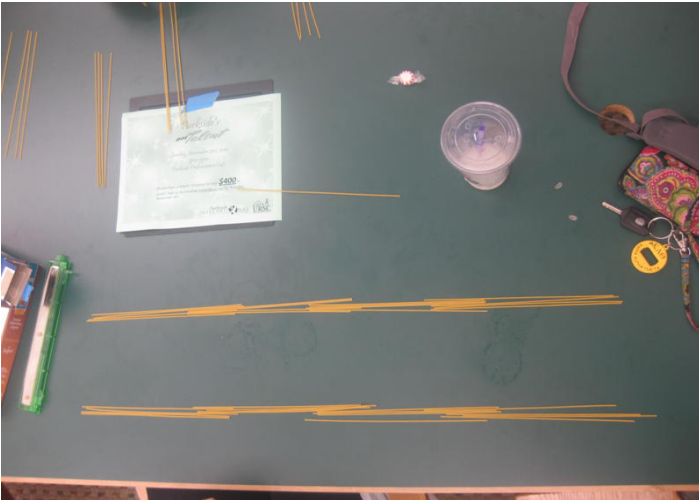


Final Model

Factor of Safety – 3.98446

Force – 1 Newton

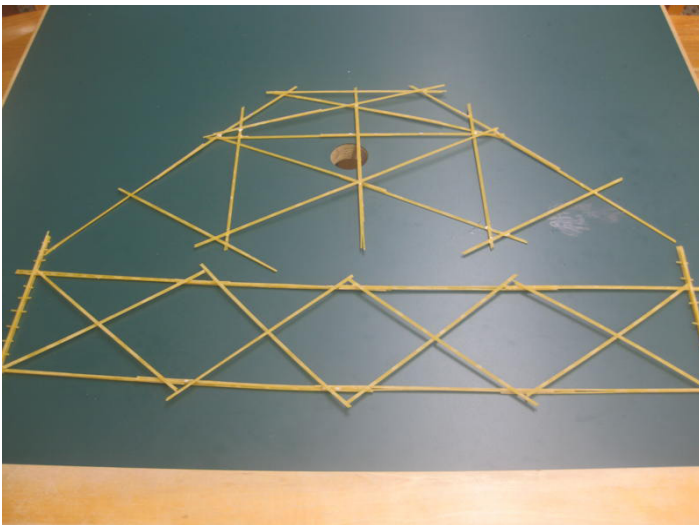
ASSEMBLY



lay out the base



glue the base

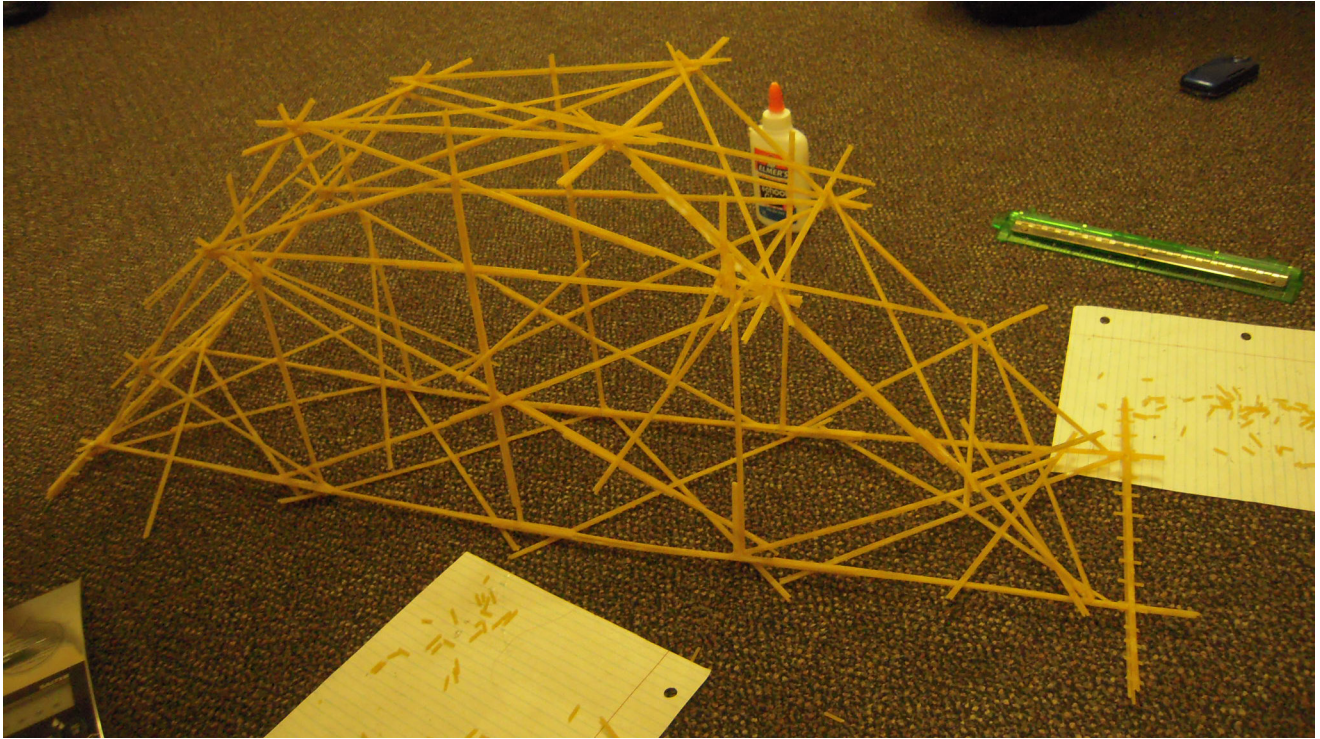


lay out the base and one side



create scaffolding to support
base and side while they dry

RESULTS



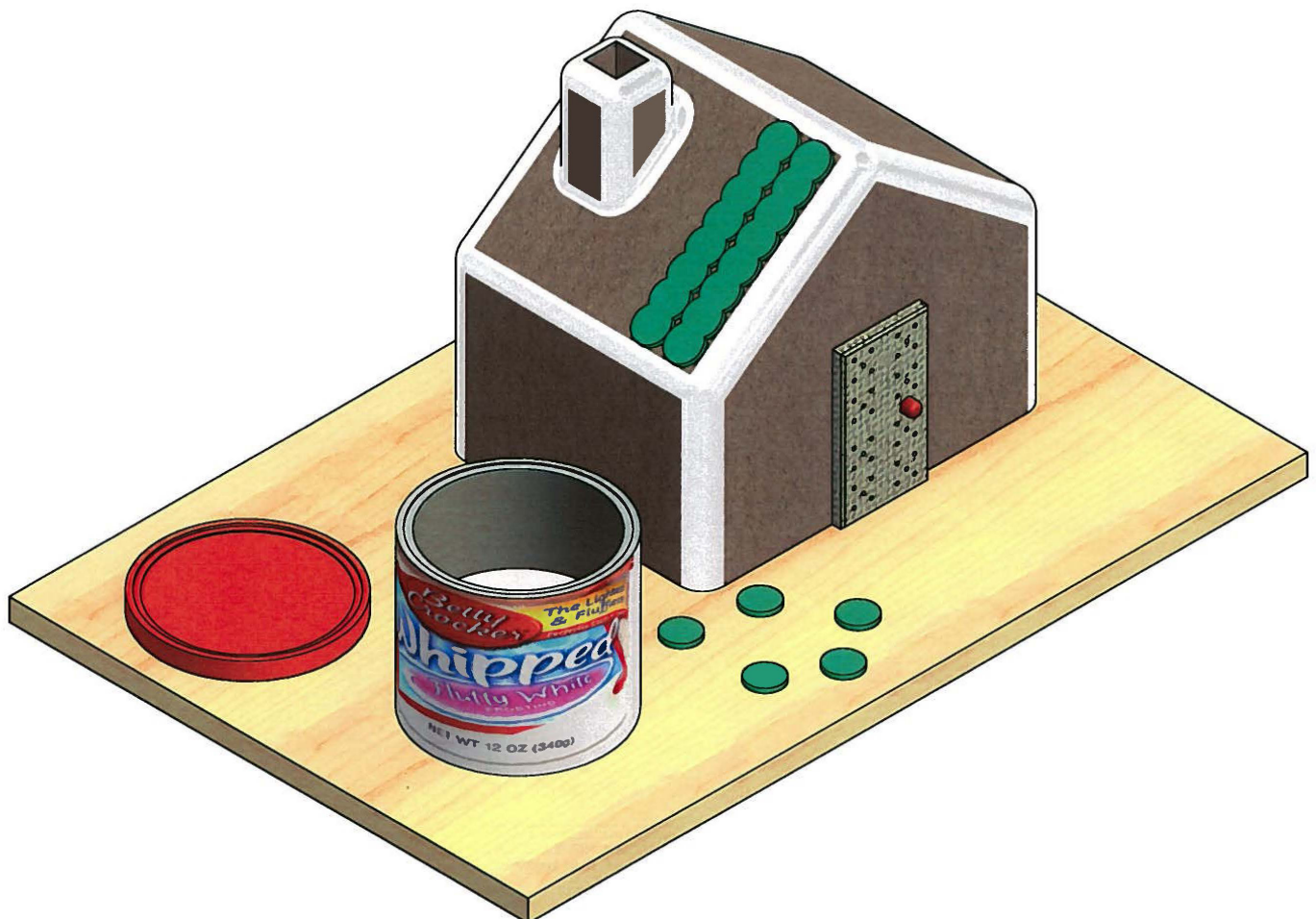
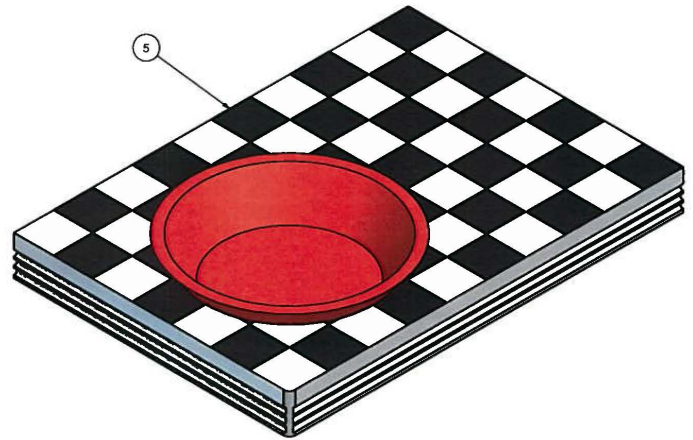
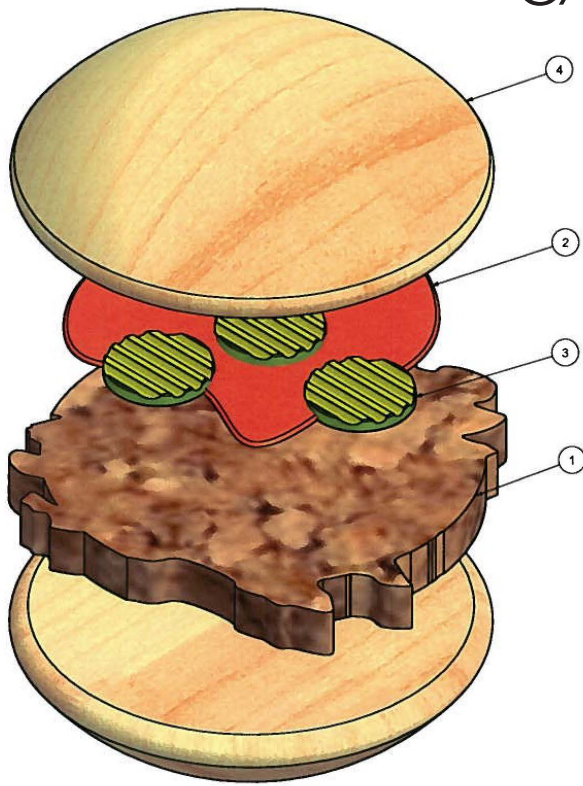
the final bridge

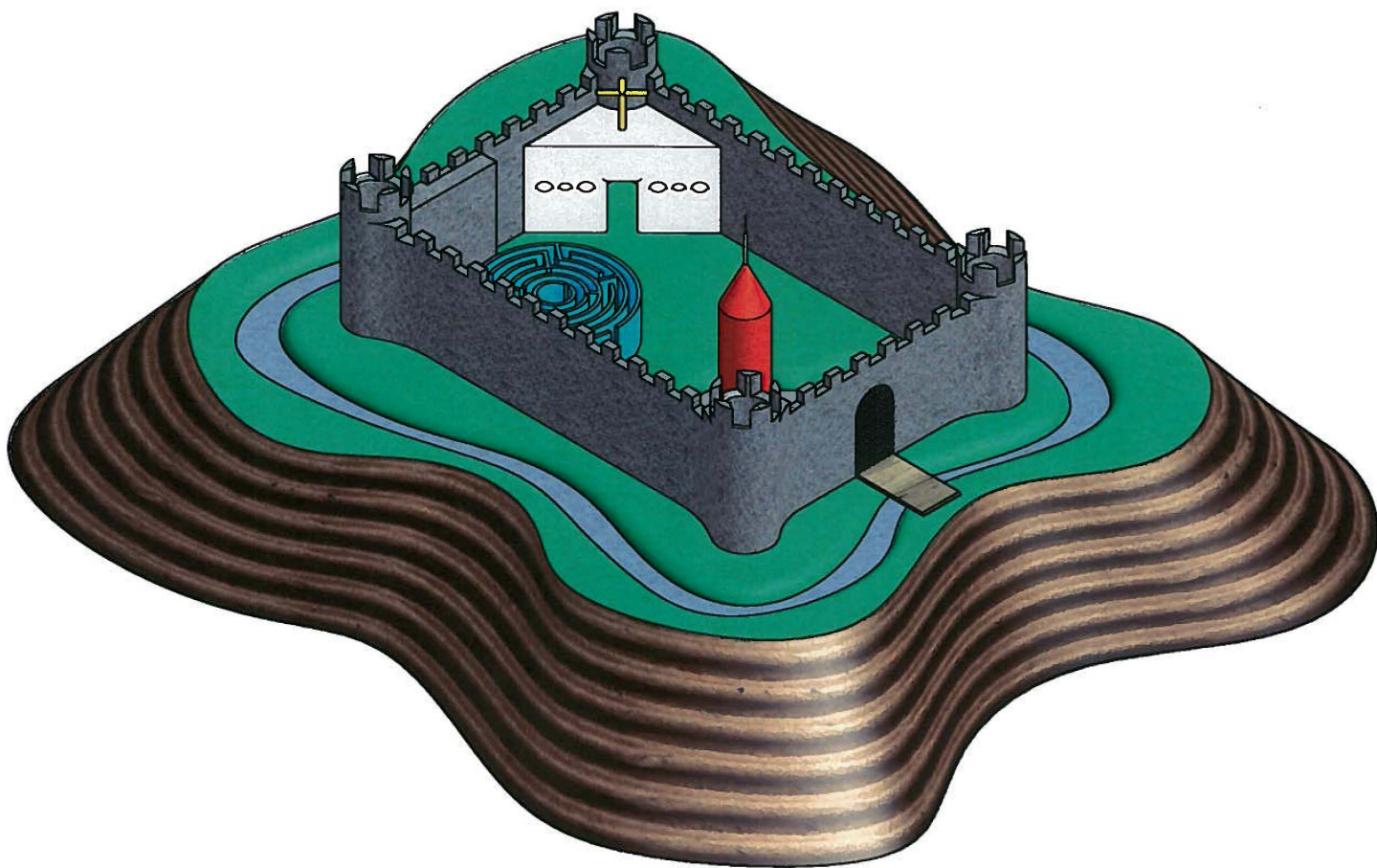
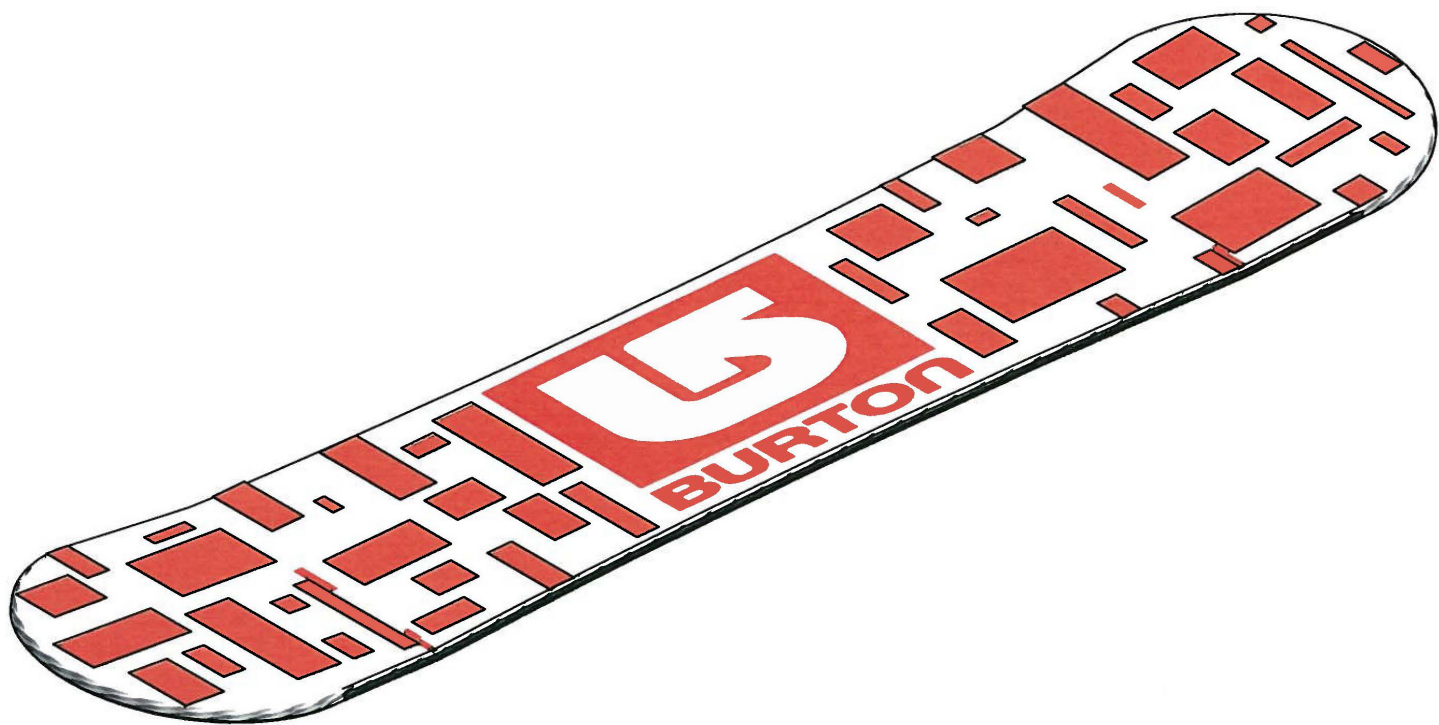
Our bridge dried slightly lopsided due to imperfect construction techniques, as well as the affects of factors beyond our control, such as humidity.

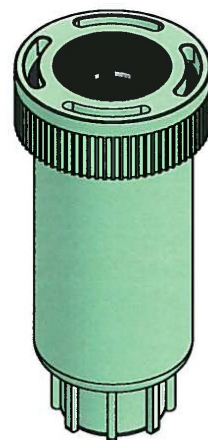
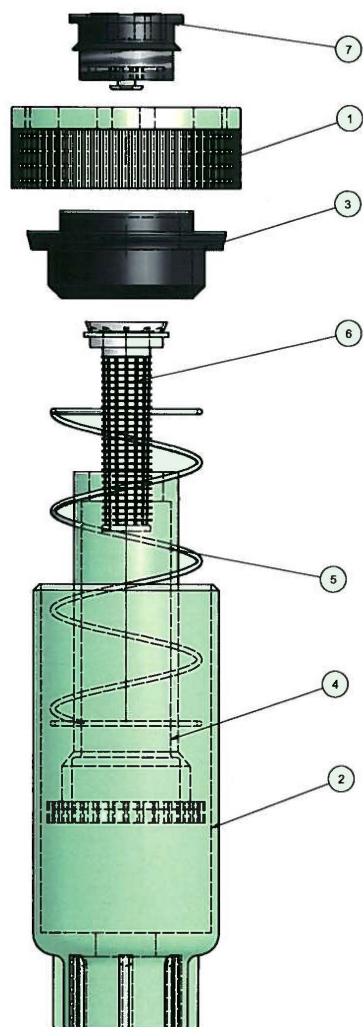
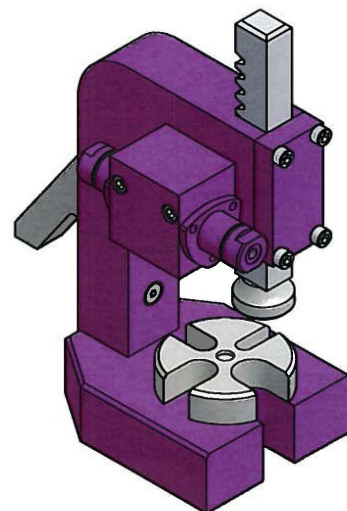
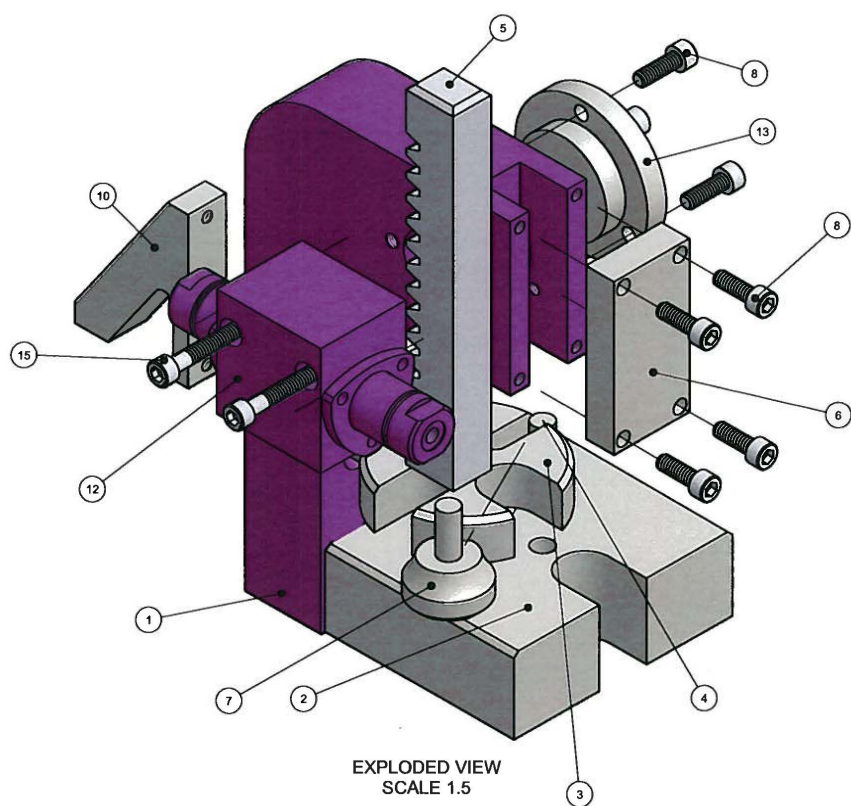
In hindsight:

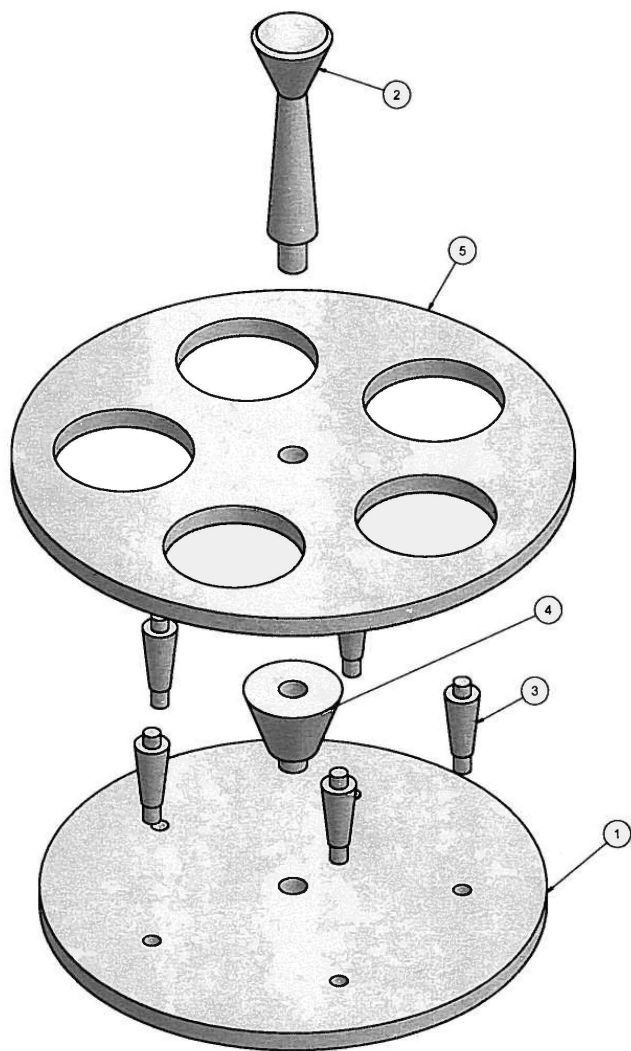
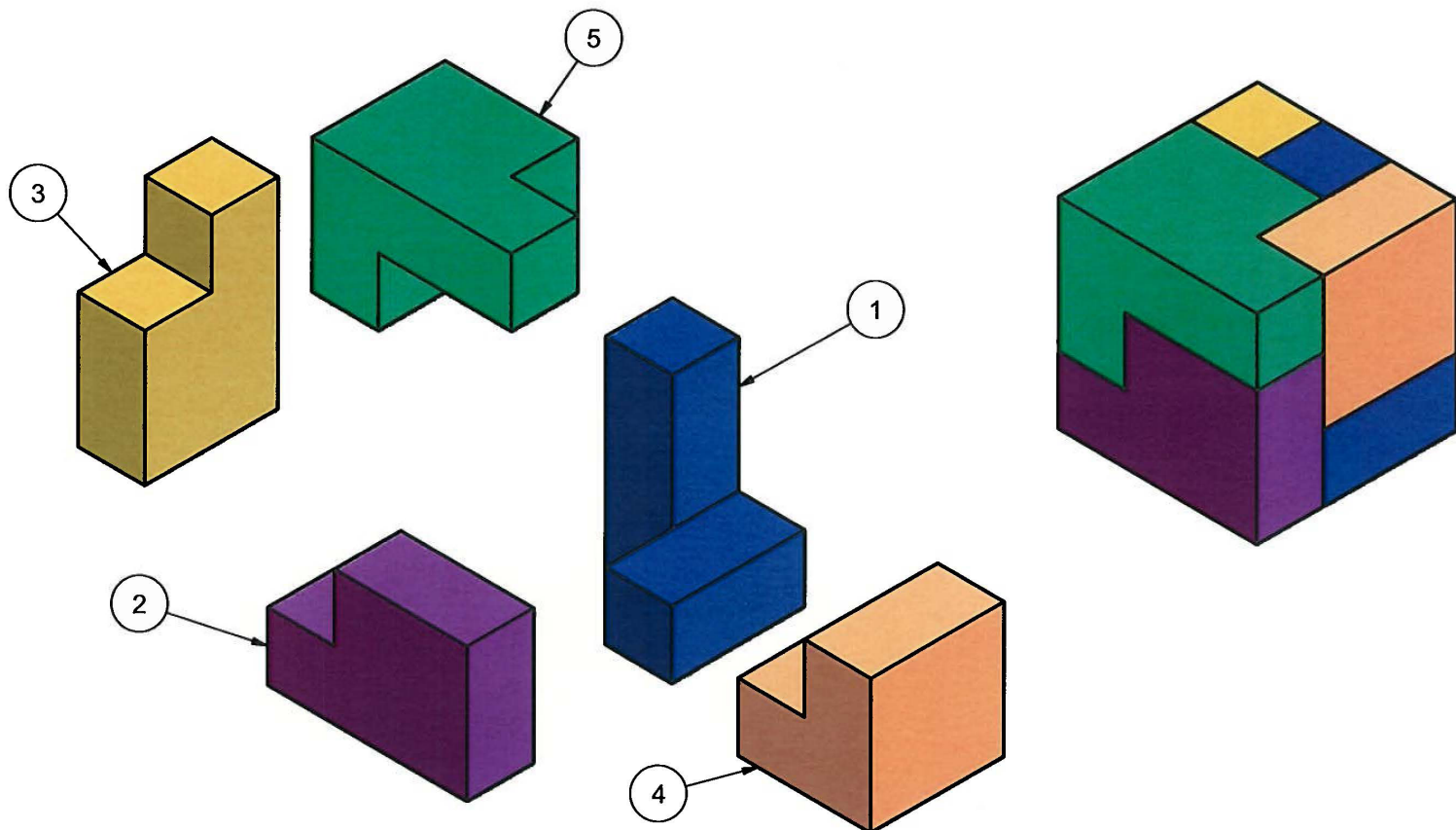
- We would have kept our model as a triangle, because a triangle is stronger than a trapezoid.
- We would have been more careful in our construction technique to ensure that our bridge was more symmetrical.
- We would have made our bridge shorter, so that we could have used the excess strands of spaghetti to make thicker beams.

CAD Drawings

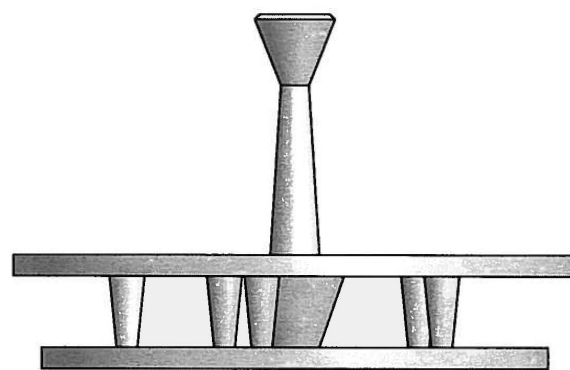








EXPLODED VIEW
SCALE .75



ASSEMBLED VIEW
SCALE .75