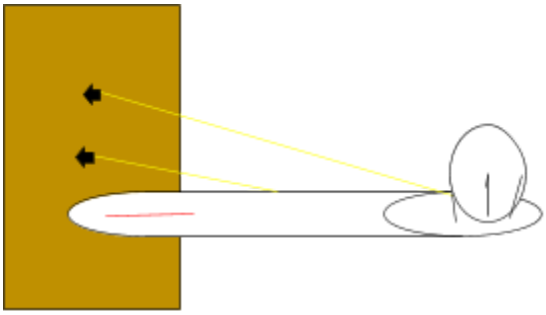
Slinger High School

Intro to Engineering

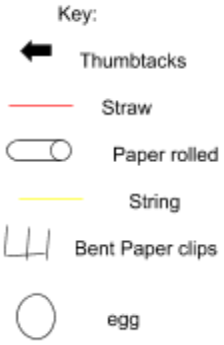
Technical Report

Cantilever

10/2/17



Drawing of
Final Design



Submitted to:
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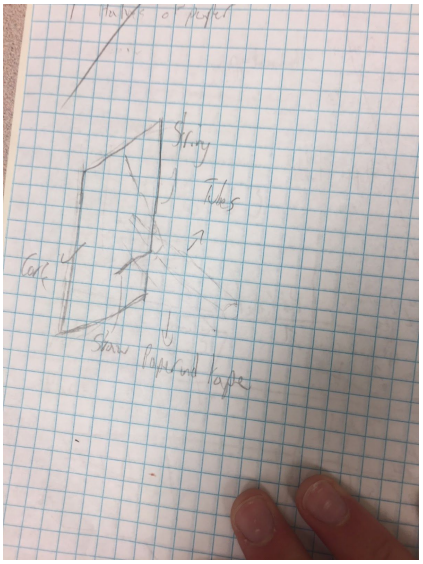
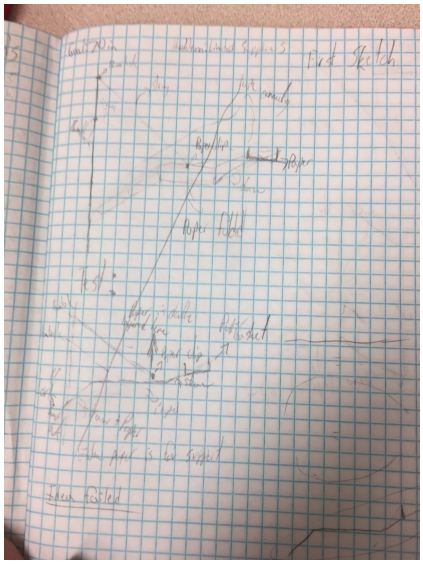
Abstract/Introduction

Our goal for this project was to create a cantilever or freestanding object that could hold an egg at 60 inches with the materials given. We followed the process of trial and error doing about four different designs (two pictured below). First we drew out the design that we thought would work,then we gathered the materials needed and started building.Once we finished building it, we tested it and if that didn't work we went and redesigned and started the whole process over until we got the design that we used and worked. Our outcome was that we came just short of our goal by only a few inches but, it still worked even with the limited materials that were given.





Problem Statement

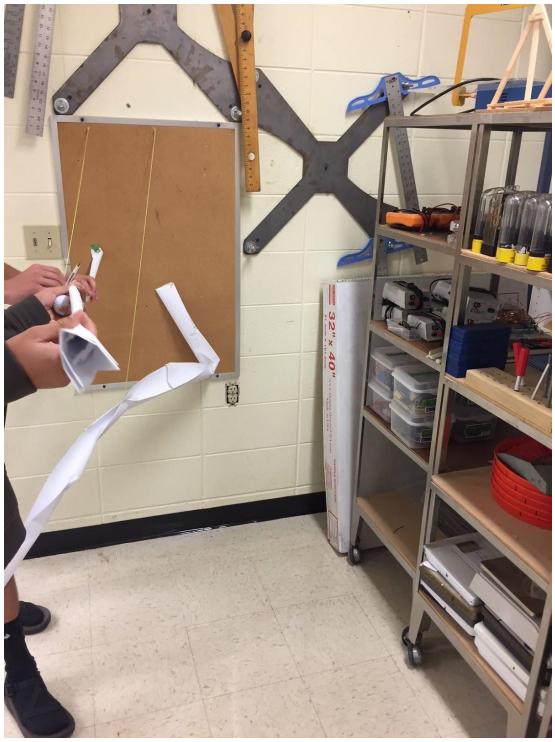
Our problem was that we didn't get to choose the materials we got and we didn't get to choose how much we got for each as well. This was a big problem because we had to be cautious of how we used our materials and be aware of what we had to work with for this project.

Goals Set

Our goal for this project was to design an original cantilever that would extend at least 65 inches. Our reasoning for this goal was because we didn't want our design to look like or have the same concept as the other designs, and we wanted to go past an A and get a higher number than most groups did. After a couple tests, we realized that our design wasn't working, so we had to redesign.

Research

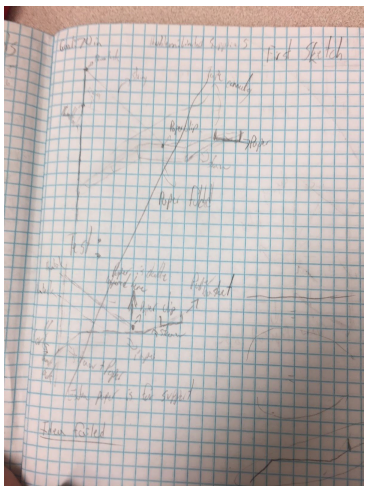
For information, we found out that we needed a strong base at the cork, because otherwise our design would fall and bend, it would not be able to hold the egg. Our first design showed that without a strong base, our whole structure wouldn't hold. We found our information by thinking back to the bridge activity and thinking about what held best there, what kind of design.

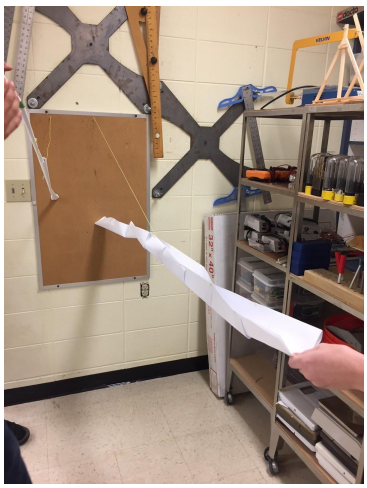


This was one of our first designs. It was a failed attempt.

Brainstorming

When we were brainstorming, we started off by both designing our own design by ourselves, and when we finished, we combined our ideas to make a design we thought would work the best. We both had different ideas to contribute, and some worked, but some didn't. When we finished building our first idea, we set it up, only to realize that the base was not strong enough. To fix this, we decided to put the plastic straw at the base to give it more support, this helped hold our product up. Also, throughout the cantilever, it was not strong enough to even support itself. We figured out that this design for the structure wouldn't hold the egg either, so we changed the design of the structure, and we pulled apart the string and made it longer.

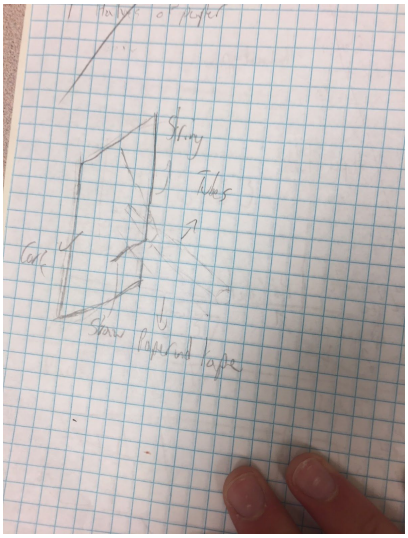




Neither of our first two designs worked but, we figured out a way to make our last design work.

Design/ Plan for Construction

We started our design by seeing what worked well for our first designs and then tried to apply that to our new one. We took the rolls of paper from one and then using a straw as part of the base from another idea. This worked well for giving us a good start on the design for the new one we stuck with and used. Then we just filled in some minor details like how we would attach it together and to the cork board but, we were just about ready to start building it.



Here is a sketch of the design we used before we made little altercations.

Build/Developing your Final Design

We started off our building process with assembling all of the paper together to make one big tube so that we could see how much tape we would use and how much we would have left. After that we attached the straw to the base to add some support and we taped the string on to the tube and put a thumbtack through the string so that we could attach it to the corkboard. We then completed the building stage and we were on to the testing stage!

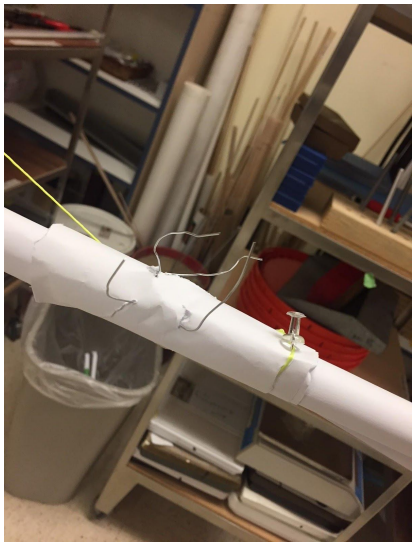
Here is our design without any load but, with altercations.

Testing

When we did our first test it could not hold the golf ball or even barely itself for that matter so we had to make some modifications to it. “We need more string!” is what we told ourselves because the string wasn’t long enough for the end to be sturdy and that was where all of the weight was. So then we had a great idea, if we pull the string apart and not cut it, it could reach farther if we tied the pieces together then. So we added this to our design and also since the paper roll was bending so much and we had extra paper we made a kind of brace around the weak spots which also helped its strength and design. Once we finished adding those on, we felt confident enough to test it. First we tested it without any load on it and it held up pretty well but, then we had to come up with a way to hold the egg and golf ball on there. So since we had four paper clips left, we formed a kind of holder for it and stuck it through the roll so that it would stay. With this attached now, we tested with the golf ball. Other than a little drip down and a little bit of a curve to one side it held fairly well. Then came the final challenge, the egg. We grabbed the egg and put it in as soft and smoothly as possible, careful not to make any sudden moves. Once we put the egg in, we slowly backed away and it held! It extended out a total of 53 inches and we felt successful on it working and having done a good job on it.

Here are two pictures of the final with the egg and golf ball.

Here is our final distance.



Here is our paper clip basket.

Analyze/Reflect/Evaluate/Conclusion

I think overall, this activity was a success, we didn't reach our main goal, but by the last day, we weren't even sure if we would be able to suspend an egg, but we did. I think our team did a good job executing this activity because we were focused and working together to come up with new ideas. Our structure at first was not successful because our base and main structure was not strong enough to hold itself, much less the egg. Also, we didn't seem to have enough supplies to build a cantilever that was very sturdy. In the end, we were successful because we suspended an egg in the air, even if it wasn't 60 inches. Some of the improvements we made were we added support to the base by attaching the straw, and also, we double layered some of the paper so that it was stronger in some areas. With these improvements, our cantilever was able to stretch out farther and was also able to hold the egg in the air without dropping it. I think that we learned about failure, and how in order to succeed, you need to fail first. I also think we learned the meaning of improvements, just the smallest improvements can make a huge difference in the end, and it did with our structure.

Appendix/References

Materials used overall:
34 pieces of paper
1 straw
72" of string
7 paper clips
4 thumbtacks

No works cited