Student 6: High Not Achieved
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Experimentation Ideas to Determine Material Properties in relation to building a bridge

Flexibility

We set up 5 weights on each wood material balanced across 2 chairs. to see how much weight they could withstand before snapping. We made sure to keep the wood at least the same width to keep the test fair. We did this test to see which material would be best for prolonged pressure.

Fire test

We used a blow torch to burn the wood and see which one took the most damage. After we torched the wood we checked if it was just external damage or if the inner structure was ruined. We did this test to see which material would be best in a fire.

Water test

We submerged each wood type in a bucket of water for roughly 48 hours. We then took the wood out and observed which one soaked up the most water and which one was the least soaked. Some pieces of wood were bendy after taking them out of the water. Before the experiment we weighed the wood then after the experiment we weighed it again. We did this test to see which material would be best in a wet environment.

Impact resistance test

We held a cylindrical weight 5 meters off the ground and dropped it onto each type of wood then checked how well the wood withstand the impact. We did this test to see what material would be best for sudden impact.

(All materials are same size and shape)

Impact resistance test

- Explain the results of your experimentations for each material.
- Identify which material you've chosen to build your bridge with and why you think it's the most suitable.

Macrocarpa: The macrocarpa Wood receive the most external damage. The weight left a large dent in the wood. This would not make an ideal bridge material for sudden impacts. The macrocarpa didn't perform well in any of tests so we will not be using it.

Kwila: The kwila wood didn't receive much external damage. There was little to no external damage after the weight was dropped onto it. This would make a good material for sudden impacts. We have decided to use kwila wood as it fits all requirements for our bridge design.

MDF: The MDF wood performed well for the impact resistance test. Much like the Kwila wood there was little external damage. But the MDF wood didn't perform as well for the other tests.

Flexibility test

- Explain the results of your experimentations for each material.
- Identify which material you've chosen to build your bridge with and why you think it's the most suitable.

Macrocarpa: The macrocarpa held up well but had a small amount of bend under the weights, the small amount of bend could be prevent the bridge from suddenly snapping, but long term tension would break the bridge. This would not make an ideal bridge material.

Kwila: The Kwila wood bent the least and held shape very well with the same 5 weights. This would make kwila ideal for holding heavy weights. Because it wouldn't suffer long term damage after having prolonged weight.

MDF: The MDF bent the most and would not make an ideal bridge for heavy objects. It also snapped in two after a certain weight threshold. MDF wouldn't be an ideal bridge material because of its weakness compared to the other two materials.

Fire resistance test.

- Explain the results of your experimentations for each material.
- Identify which material you've chosen to build your bridge with and why you think it's the most suitable.

Macrocarpa: The macrocarpa wood received a fair amount of damage from the blow torch. This damage caused external damage as well as internal damage making it very easy to break snap the wood. This would not make an ideal fire resistant material.

Kwila: The kwila wood received little external and internal damage. The Fire didn't cause much damage other than charring the the top layer of wood. This would make an ideal material for short bursts of fire.

MDF: After doing external research into MDF wood and burning we can see that it releases toxic gasses when burnt. Didn't know that when we were burning it. This would be a bad bridge material…

Water soak test

- Explain the results of your experimentations for each material.
- Identify which material you've chosen to build your bridge with and why you think it's the most suitable.

Macrocarpa: The Macrocarpa held an average amount of water, it didn't flex as easily but still soaked up a large amount of water which weakened it. Before getting wet it weighed: 138g. And after getting wet: 162g

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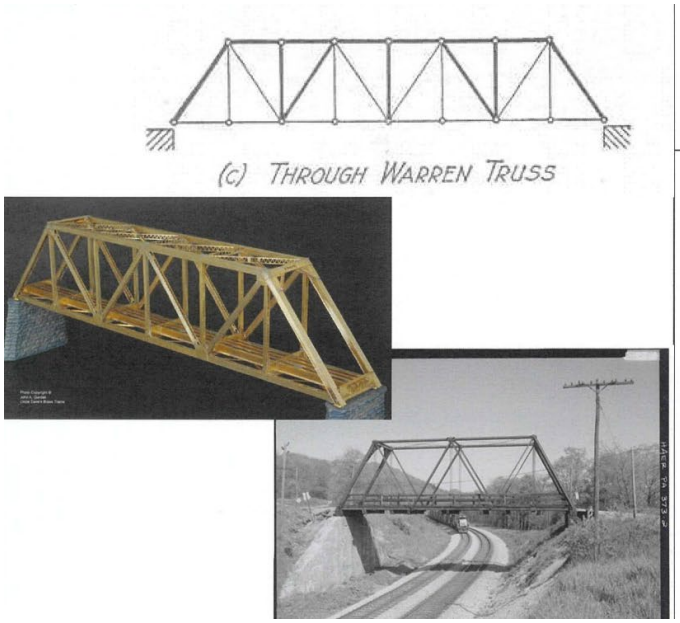
Kwila: The Kwila wood soaked up a very little amount of water even after soaking for 48 hours. It was also inflexible after taking it out of the water. This would make an ideal bridge material based on this test since it would be ideal for a wet environment. Before getting wet it weighed: 310. And after getting wet it weighed: 318

This numbers further back up the conclusion met. The weight also helps us determine other properties like weight density. This information will help us come to a conclusion for our other experiments like impact resistance because we want a more dense material.

MDF: The MDF wood Soaked up the most amount of water and became very flimsy and weak. It was so weak that I could flex it. This would make a bridge material because as soon as its exposed to water it would cripple under any weight. Before getting wet it weighed: 164. And after getting wet it weighed: 224.

. Experiment Photos (we dunked the wood for about a minute then were received feedback that we should do it for 48 hours to see better results, so the result are not 100% accurate but they wouldn't of gained any meaningful weight after being dunked ford for 1 minute)

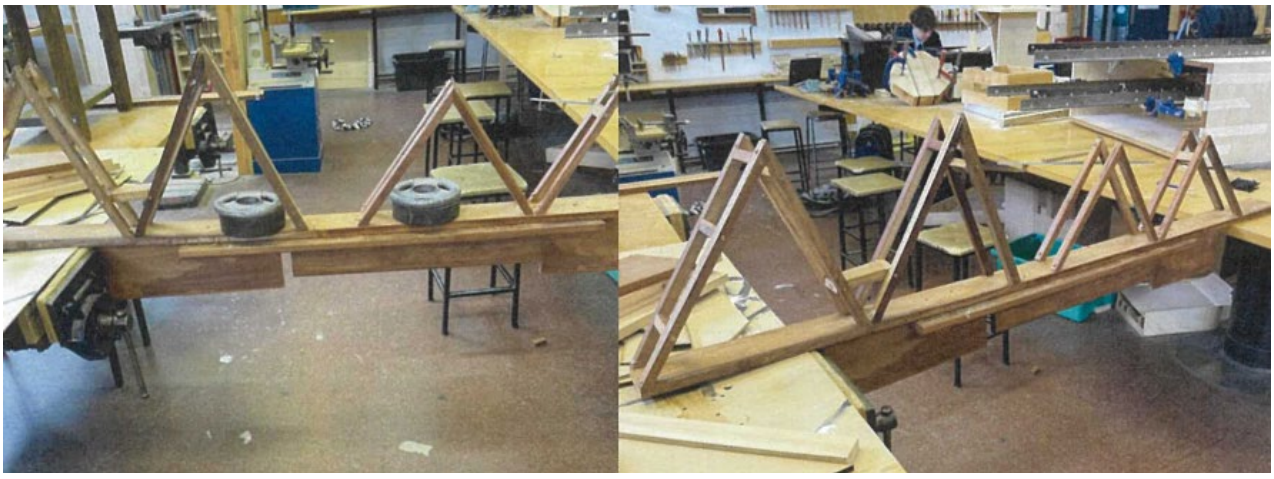


Why have you chosen this design? We chose this design because its inline with the requirements we want our bridge to meet and works with the wood material we chose, Kwila. We needed a bridge that was made out of straight lines like through warren truss. This was because the kwila wood was unable to flex after being soaked in water and didn't bend and could support a lot of weight. It also received the least external damage from the the impact resistance test and received little amount of damage from the fire.

Feedback on your decision to build your chosen bridge with your chosen material: (Written or photos).

matthew : using your chosen bridge design will be a complex task as there is heaps of trusses to measure and fit against one another a support idea would be to add a thicker base so you don't have to rely so heavily on the trusses.

Explain any decisions you might make to the design or material now that you have received feedback? My group will implement a thicker base and rely less on trusses because the measuring cutting, building and adding them takes up alot of time, when a lot of the strength will come from the base which will be easier to strengthen.



Explain the success or failure of your bridge: The trusses were quite hard to incorporate because they took a lot of time to build and attach, so we decided to strengthen the base which was suggested during the feedback, this overall helped our bridge and I think the strong base was where most of the strength came from. The biggest failure for our bridge came from the time constraint we couldn't fully implement the amount of trusses we originally wanted. To compensate for this we added more support to the base. In retrospect the best design would be a bunch of planks stacked ontop of each other. Overall our bridge performed averagely and was semi successful but more steps could of been taken such as implementing more trusses if we had more time. If we could redo the bridge and had more time possibly wood glue or a nail gun would of been ideal.

Was your chosen material the right material for your bridge - why/why not? The kwila wood was definitely the best material because its versatility and high performance during the tests it underwent. But it was also a root of many problems it being a very hard wood make it harder to construct because it gave more resistance during drilling. I also think our strips of kwila were too thin and split quite easily. If we had more time I think maybe wood glue would also work or we could of relied on a nail gun to speed up the construction process.