CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
S0214

Project Title
Stress Analysis on the Length of Compression Chord Affecting the Efficiency of a Cantilever Structure

Abstract

Objectives/Goals
The purpose of the project was to discover a correlation between the compression chord of a boomilever and its structural potential to lift and sustain a principal load. The manipulated variable was the length of the compression; and the responding, dependent variable was the subsequent.The utmost successful outcome of this task would be discovering how each individual element interacts and distributes the load of the structure. It was hypothesized that the structure with the longest compression chord will hold more, but the weight would make it a less efficient boomilever.

Methods/Materials
10 boomilever structures were made with the variable components at either a constant or in proportion. A boomilever is a triangular structure with a 90 degree angle at the base supporting the structure. With the principal load affecting the end of the free supported leg, the hypotenuse of the structure would be in compression. By altering the compression chord, forces within the structure will be distributed in varying ways. In order to maintain the form of the cantilever structure, the longer leg was extended accordingly. The leg that was supported against the wall and the depth of the boomilever was set at a constant. The trusses intersected in a Warren Truss pattern at 3 points. These points were equidistant along the hypotenuse as well as the freestanding leg. These described structures were then placed on a testing rack. Weight was then poured into the free-standing angle by the means of an attached bucket until the structures became unsupportable.

Results
Unlike the previously-thought hypothesis, there appeared to be a negative correlation between the length of the compression chord and the weight it could carry.

Conclusions/Discussion
This was reasoned to be because as the length of the compression chord increases, the concentrated weight is farther away from the testing wall, making the structure more unstable with moment force. In conclusion to the experiments, as the length of the compression chord increases; the maximum potential loads, as well as the efficiency, decreases.

Summary Statement
The project is on altering the length of the chord in compression on a boomilever structure in order to find the structure that can carry the most wieght as load in kilograms.

Help Received
Father helpd with construction (ie. jigsaw)