Maximizing Cross Bracing Efficiency on Towers

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We investigated and experimented with structural integrity of towers from maximizing the amount of cross-bracing to enhance efficiency until a drop off point and fortify structures against dynamic loads. We discovered and created the best tower design with the highest efficiency score through low cost effective models using balsa wood and CA glue to construct the tower. We tested these various cross bracings designs using a testing apparatus to receive data. The results corroborate our hypothesis: the tower with 6 cross bracings demonstrated the highest efficiency, while the 8 cross bracing design showed a drop-off point as load capacity plateaued. This aligns with Euler's critical load theory, where increased moment of area in a cross-section reduces load capacity, meaning that doubling the height of a cross bracing, causes it to only hold one fourth of the load before buckling. In conclusion, the data supports the hypothesis, revealing that the 6 cross bracing design achieved the highest efficiency until load capacity peaked, while the 8 cross bracing design exhibited a notable drop-off point and the 4 cross bracing design had the lowest efficiency. These findings contribute to understanding tower stability and creating the most efficient design to inform future structural design considerations. As this research relates to the field of science of civil engineering, it has a powerful impact on the society we live in today through towers, which are one of the most important structures to this day.