The Effect of Architectural Design on Supertall Building Flutter Acceleration

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Prior studies have shown varying architectural designs can be implemented to positively impact a supertall building's flutter acceleration during wind events. To explore the impact of different architectural designs, an experiment was conducted. The purpose was to determine the effect of architectural design on flutter acceleration. Four buildings with Circular, Corrugated, Octagonal, or Spiral Fins architectural design were constructed using aluminum flashing and wood. Ten trials were conducted for each architectural design. To determine the flutter acceleration, an accelerometer was attached to the building. A wind tunnel was constructed using a leaf blower to induce building flutter. The flutter acceleration was lowest with the Spiral Fins architectural design. This can be explained because a horizontally and vertically non-uniform architectural design like Spiral Fins resulted in the greatest vortex shedding and disruption which effectively reduces flutter acceleration. From best to worst flutter acceleration, the architectural designs were Spiral Fins, Octagonal, Corrugated, and Circular, respectively. Data analysis using a t-test showed the p-value was <.0001. The results indicate that as vortices created by wind are disrupted by effective architectural design, flutter acceleration decreases. The experiment confirmed that an effective architectural design can help to lower the flutter acceleration of a building during extreme wind events. A future experiment could be to determine the optimal spiral fin slope and orientation that maximizes vortex shedding and limits flutter acceleration.

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