



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Elizabeth A. Cullum	Project Number J0307
Project Title Can You Make a Hurricane Proof House?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Each year, homes, lives and communities are destroyed by hurricanes around the world. In the US alone, billions of dollars worth of damage left the country devastated after hurricanes Harvey, Irma, and Maria. Therefore, the objective of this project is to create a hurricane proof house that can survive a category 5 hurricane.</p> <p>Methods/Materials I first researched aerodynamics and current storm resistant shelters. Then I made a scale drawing of the proposed hurricane proof house. Using the drawing, I created a wood template to form the wire frame. I began by bending rebar tie wire around the template representing the steel frame of the house. Then I covered this frame with aluminum wire mesh. Next, I covered the wire frame and foundation of the house with Ferro-Cement. I purchased all my materials from Home Depot. After the structure dried, it was tested in proportional ocean waves at Cardiff Beach. The waves simulated the hurricane flood surge that comes in a category five hurricane. I also tested the model with a leaf blower to simulate the hurricane force winds of 160 mph.</p> <p>Results During the wind test, the leaf blower produced winds at 160 mph, which simulated the power of category five hurricane force winds. A dial indicator was set to zero and placed on the model to check for any harmonic oscillation. There was zero movement, during the test. The distance from the wind source varied from 16cm, 8cm, 4cm, and 2cm. The aerodynamic shape of the house allowed the hurricane force winds to easily pass over and around the house without causing damage. During the flood surge test, the model was placed in 5cm, 10cm, and 15cm wave heights at Cardiff Beach. The pedestal allowed the waves to flow under and around the house, yet left it still standing tall and strong.</p> <p>Conclusions/Discussion This project proved the importance shape plays in a building's survival or destruction during a storm. Combining an aerodynamic shape with a pedestal house and a concrete construction, gave strength and durability to the design.</p>	
Summary Statement In this project I designed, constructed, and tested a model of a hurricane proof house.	
Help Received I consulted with Andrew Cullum, a contractor and designer, about the scaled drawing. He provided tools and machinery for building the model. I consulted with Richard Stinchcome, an aeronautical engineer, for understanding of laminar flow and aerodynamics. I did the template, model, and testing.	