



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

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Project Title
Slowing the Flow: Saving Society from a Tsunami

Abstract

Objectives/Goals
 If an object in water can change the flow of the water and decrease its momentum, could a structure be placed in the path of a tsunami to weaken its impact?

Methods/Materials
 Wave tank dimensions were 4x8x2ft. Measurement lines were made on the side & back walls of the tank & the top of the continental shelf. When a 25-lb weight was dropped, the lever forced a hinged flap to raise, producing a wave. 2in tall shaped wood dowels with diameters of 1/4 to 3/4in & were used to simulate structures. They were mounted on the continental shelf using brad nails which had the heads cut off. Three cameras were located at various angles around the tank. One was positioned to view the continental shelf & the measurement lines from above to measure the wave velocity & the wave wake. The second was positioned at the side of the tank to measure wave height. The third camera was positioned above mid-tank aimed at the wall behind the beach to measure wave impact height on the back wall. Wave footage from each camera was then analyzed frame by frame & the resulting data is below.

Results
 Tested Models: Control, Small Circle, Med Circle, Lg Circle, Med Square, Med Diamond, Lg Square, Lg Diamond, 1/4 Round Curve, 1/4 Round Inverse, L Catch, and L Shape.
 Avg Wave Height (in) Results for Each Model: N/A, 6.39, 5.25, 5.05, 4.28, 4.42, 4.07, 3.89, 3.81, 3.54, 4.2, 4.9, 4.91, 5.82, 4.64
 Avg Wave Wake (in) Results: 0.84, 1.05, 0.92, 0.95, 0.86, 0.92, 0.82, 0.91, 0.97, 1, 0.96, 0.9, 0.94, 0.88, 1
 Avg Velocity @ 5in (in/sec) Results: 27.5, 25.5, 27, 25.23, 21.67, 24, 26.25, 25.83, 27, 27.75, 26.25, 26.67, 24.75, 27, 26.25
 Avg Velocity @ 12in (in/sec) Results: 25.5, 27.75, 26.25, 27.27, 21.67, 27, 29.25, 28.33, 30, 28.5, 26.25, 28.33, 27.5, 27, 27

Conclusions/Discussion
 The dowels along the continental shelf did have an effect. All the dowels changed the wave to some extent. Most shapes actually increased the velocity of the wave after the dowel. Taking all the data results together, the medium square was the most beneficial of shapes to achieve the desired effect of lessening the impact of a tsunami wave. Applying the results to real life, four 20-foot wide rectangular posts at 360-feet apart could reduce the velocity of the wave by 15-20% after impacting the posts.

Summary Statement
 Testing if tsunamis can be slowed or weakened by objects on the edge of the continental shelf.

Help Received
 Mother assisted in camera and wave initiation operation; both parents in tank construction.