



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b> <b>Ishan Juluri</b>	<b>Project Number</b> <b>J0316</b>
<b>Project Title</b> <b>The Effect of Tuned Mass Dampers on Oscillating Buildings</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> Skyscrapers are one of the most vulnerable buildings to suffer in an earthquake. The moving ground causes the building to vibrate at destructive levels. The objective of my project is to see how Tuned Mass Dampers (TMDs) can help a building quell extra oscillations after earthquakes or strong winds.</p> <p><b>Methods</b> A 24 inch tall building was constructed. Then, a pendulum was attached to the bottom of the roof. An accelerometer was attached to the top of the roof. Attached to the wires running down from the accelerometer was an Arduino. The Arduino was attached to my laptop. The Arduino's purpose was to capture the data coming from the accelerometer and then translate it into a readable format. To tune the pendulum, I tightened or loosened a screw in the pendulum's coupling bracket. To mimic motion in the building, I attached a bungee cord to a hook in the bottom of the building and then to another hook in a piece of wood, I placed two pieces of wood, to stop the building abruptly. To stop the building from toppling over, two bricks were used as a counter balance.</p> <p><b>Results</b> The result of this experiment proved TMDs did reduce oscillations in a building. The building with a tuned mass pendulum's oscillation reduced by nearly 70%. A 50% drop was measured in the oscillating amplitude of the building.</p> <p><b>Conclusions</b> The results of my experiment support my hypothesis that tuned mass pendulums help prevent catastrophic shaking in buildings during earthquakes. This happens because the pendulum acts as a counter balance. When the building leans one way, the pendulum swings the other way. Thus, the building outfitted with a tuned mass pendulum effectively stops oscillating much faster with less amplitude.</p>	
<b>Summary Statement</b> My project is on the effect of Tuned Mass Dampers on oscillating buildings.	
<b>Help Received</b> Dr. Ismail explained the concept of resonance and how it relates to earthquakes and building motion	