The Relative Seismic Resistance of Different Structural Aspects of the Pantheon

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The Pantheon is well regarded for its stability, having survived multiple earthquakes in its long history. Its stability is due to five characteristics, in which it was hypothesized the lower portion of the dome with tension rings would be the most stable, followed by the center of the dome, the upper portion of the drum with arches, the lower drum, then the oculus. Utilizing these features in current unreinforced masonry buildings could reduce the possibility of their collapse during an earthquake. To determine what aspect most contributes to the Pantheon's stability, a model at a ratio of 1:86 to the real structure was constructed out of popsicle sticks, foam board, and hot glue. The stability of the model was tested using a Quanser Shake Table II at a local university, with accelerometers placed on the 5 different aspects of the model, as well as one at the base to compare the others to. The relative stability of each feature was based on the amplitude, with the least stable features having the highest amplitudes on average. The results put the lower drum at most stable, followed by the upper drum, tension rings, center of dome, and the oculus. This data can be used to present the idea of using rotundas as opposed to rectangular floor plans, as well as corroborate using tension rings in order to increase the stability of a dome at its base.

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