

Shake, Rattle, and Roll



Scientists have studied the effects of earthquakes on structures, such as buildings, bridges, and roads. Based on their observations, architects and engineers have designed features that enhance a structure's ability to withstand the effects of earthquakes. With your team, try building your own structure to see if you can discover some of the features that minimize the effects on a building when the earth shakes.

Your Assignment:

Construct a building of at least 30 cm (approximately 12 inches) tall that passes the test for your team's challenge. You will need to use all the materials you are given. When your team has finished, test your structure by following the test procedure listed under your team's challenge.

Challenge #1: High Impact

Design a structure that will remain standing even when a heavy book is dropped onto the floor next to the structure.

Test: Tape a piece of graph paper to the floor and place the building on the paper. You may not fasten the building to the floor or to the paper. Trace the foundation of the building with a pencil. Use a tape measure to find a height of 2m (approximately 2 yards) above the floor. Drop a heavy book onto the floor directly next to the structure. Carefully pick up the book and use a colored pencil to retrace the foundation of the building. Measure the distance that the foundation moved from its original spot on the paper.

Challenge #2: Hillside Home

Design a structure on a slanted surface so the structure does not slide downhill even when an impact strikes the hillside. Build the structure on graph paper. Measure one end of the surface 8 cm (approximately 3 inches), so that this end is higher than the other end. Do not fasten the structure to the graph paper.

Test: Use a pencil to trace the foundation on the graph paper and tape the paper to the hillside. Then drop a small weight, such as a packaged box of staples or a wrapped package of index cards, from a height of 30 cm (approximately 12 inches), directly above the uphill wall of the structure. Remove the weight carefully and use a colored pencil to retrace the foundation of the building. Measure the distance that the foundation moved when the weight was dropped.

Challenge #3: Rolling Along

Build a structure on an unstable surface that will not fall down even when the surface moves beneath the building.

Test: Fill most of the top of a shoe box with a single layer of marbles so that marbles can still roll. Set the building onto the marbles. Using a stopwatch or a clock with a second hand, begin sliding the box back and forth a distance of 5cm (approximately 2 inches) in each direction at a rate of 1 shake every 5 seconds. Increase the speed slowly until you are shaking once per second. The building may move, but it may not fall over. If it falls over, record the speed at which you were shaking when it toppled.

Observations

Challenge 1 2 3 (circle your challenge)	Structural characteristics	How building was affected by test	Why building reacted that way	Recommendations for change
First team				
Second team				
Third team				