

# ARACHNOGUARD

## Introduction

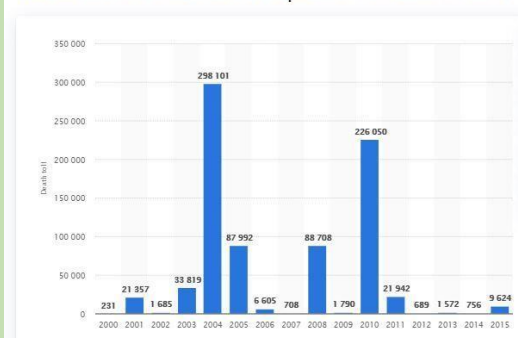
Earthquakes can cause the ground to shake and crack apart. Earthquakes can be very powerful, and if they occur in or near areas where people live, they can make buildings collapse, bridges sway and roads buckle.



Earthquakes are usually caused when rock underground suddenly break along a fault. This sudden release of energy causes the seismic waves that make the ground shake. When two blocks of rock or two plates are rubbing against each other, they stick a little. They don't just slide smoothly; the rocks catch on each other.

Many buildings collapsed during an earthquake. For example, the earthquake in Latin America in 1985, 30000 buildings collapsed standing as the main reason for the loss of life and property. It is estimated that 10,000 people lost their life only because of the collapse of buildings.

Global death toll due to earthquakes from 2000 to 2015



The Arachnoguard is a mechanism designed to earthquake-proof a building in an eco-friendly way. It consists of spiderweb-like structures that is attached to the framework of the building and the ground. These structures are enclosed within hexagonal frames. Hexagons and spider, being two of the most stable structures in nature, helps the building to withstand the vibrations produced during the earthquake.

## Thesis:

- \* What is Arachnoguard and how it works.
- \* Why is it better than other earthquake-proofing methods?

## Our Goals



## What inspired us?

We were inspired by Biomimicry. Biomimetic or biomimicry is the imitation of the models, systems, and elements of nature for the purpose of solving complex human problems. One of the examples are Tree-Climbing Robot Mimics Inch Worms. The elements taken from nature here are spider webs and honeycomb structures.

## How does it work?

Spider web structures are quite flexible and are vibration resistant. Hexagonal structures fill a space with the least amount of material. These structures are connected to one another to form a honeycomb-like design and the spiderweb-like structures are enclosed within these hexagons.

During an earthquake, high magnitude waves are produced that results in vigorous vibrations. These vibrations are distributed around the building instead of being concentrated on one certain area. As these vibrations are passed around the building, the waves are balanced, thus reducing the impact of the earthquake.

## Electricity Generation

Earthquake produces energy into the soil. This energy is passed on to Arachnoguard that surrounds the building. This generated energy can be converted into electricity. We are still researching ways to convert the energy into electricity and store it.

## Why choose Arachnoguard over other methods?

Earthquake-proof buildings exist in this world such as the Burj Khalifa and the Tokyo Skytree. A large reinforced concrete mat likewise supported by bored reinforced concrete piles provides earthquake resistance to Burj Khalifa. On the other hand, the architects of the Skytree used a similar technology to secure the structure—a central concrete tube runs almost the entire height of the tower.



Both the methods mentioned above uses concrete in a large amount to make earthquake-proof a building. The cement industry is one of the primary producers of carbon dioxide, a potent greenhouse gas. Concrete causes damage to the most fertile layer of the earth, the topsoil. Concrete is said to be responsible for 4-8% of the world's CO2 and stands as one of the main

reasons for the cause of earth Pollution. On the other hand, Arachnoguard does not use concrete. Thus, it's an eco-friendlier method of earthquake-proofing a building.

## Materials:

Metal rods are to be used in the making of Arachnoguard. While choosing the metals to be used, the points to keep in mind are as follows:



- ✓ It must be durable.
- ✓ It should not undergo corrosion easily.
- ✓ It should have considerable strength.

According to our researches, we advise using electroplated iron rods as it satisfies the above-mentioned conditions.

## Highlights of Our Experiences

The Arachnoguard had been selected for other competitions. They are listed below: -

- ✓ The Sastra Prathibha Contest – Innovation challenge
- ✓ Digifest

## What did this project teach us?

The Arachnoguard project helped us learn a lot of new things. We acquired knowledge regarding the miracles architecture can bring about. We also learnt about other methods of earthquake-proofing a building. Our researches also included a detailed study on earthquake and their effects and the statistical report of the number of deaths caused by the collapsing of buildings during an earthquake. We also learnt about economic feasibility and marketing strategies.

But, the more importantly, we learned about nature. We learned how nature is our best cheat sheet. We realized how nature is filled with innovation. Nature has all the answers we need. One should only seek it.

Through this, we were able to learn about Global Social Leaders' society. It gave us a platform to express our ideas. Taking part in this competition was one of our best experiences.

## Our Journey

This project was the result of a lot of hard work, research, commitment, dedication and much more. We held regular meetings with the teachers to discuss the progress of the project. We contacted another expert in this field for further knowledge. We started working on this project in May 2019. The progress went really well and we kept track of everything. Every step we took was productive and we enjoyed each and every moment of it.

## Our Gratitude

We take this opportunity to thank the school and our teachers for their support and help. We would like to express our special gratitude to Ms. Shrutika Kale (teacher in charge) & Ms. Anita Sanal Kumar (Innovation Supervisor).

## Team Members



*Aysha Abdur Rahman  
(Team Leader)*



*Shanza Basheer  
(Supporting Member)*



*Digifest*



*Building the model*

Video submission:

<https://www.youtube.com/watch?v=ID7sQTIVwWU>