Frankenstein of Foundational Protection's Technology

Present forms of Technology

The world suffers every year from over 300 natural disasters, including earthquakes, tsunamis, hurricanes, and more. These disasters affect over 2 per cent of the world each year and kill as many as 60,000 people. Natural disasters not only affect people; they also displace or kill plants and animals, disrupting the environment. During floods, when water moves inland, thousands of fish and other sea creatures can be carried onto land. In our project, we are not just trying to make an all-purpose safety technology; we are trying to make it affordable for people across the world, which will help the environment stay healthy as well. There are many technologies that exist to protect housing and other buildings, though they are often too expensive for many people to afford. Around 50% of the world cannot afford to pay for advanced safety technologies. Though our technology would still not be affordable for everyone, we are hoping we can make it affordable to many more people.

One very useful technology that we use today for protection from earthquakes is Base Isolation. Base isolation helps reduce the shaking of an earthquake to keep people and buildings safe. A building is placed on top of rubber or steel pads between the ground and the structure. The shaking is prevented through the pads absorbing most of the movement's shock. We also use Hurricane-Resistant building designs, such as reinforcing the walls, doors and windows with steel or other strong materials such as wood. These designs help keep buildings safe from strong winds and heavy rain during hurricanes. Roofs, windows, and doors are also reinforced so that they do not break off as easily. In the end, buildings are much less likely to be torn apart or flooded by a hurricane using these technologies. The most common way that people try to protect their homes is to put them on stilts. The stilts keep the house raised above the ground so that floodwaters will go under the house instead of flooding and damaging the house if it were on the ground.

Limitations

One of the problems associated with housing built on stilts is that they don’t withstand earthquakes well. While the elevated house allows water to pass underneath, avoiding water damage, if the environment in which the house is built is also prone to earthquakes, the stilts could easily break, causing even more damage to the home than the earthquake alone. In countries such as the Philippines, Chile, and Pakistan, which are all prone to water-related disasters and earthquakes, this could very easily become more of a problem than a solution. Another large issue with normal wooden stilts is that they easily decay over time due to factors such as termites, material degradation, or moisture entering the wood over time, causing it to rot. There have been many attempts to replace the wood with steel or concrete, but even then, these materials eventually deteriorate. Once the material decays, there are many places all over the world that would struggle to replace those resources financially, let alone purchase them in the beginning. The last large problem with stilts is that when built improperly, it is possible that the home’s foundation could crack, shift, or settle. If the stilts are too thin or too thick, they could cause many more unnecessary issues. In more financially stable countries that struggle with water disasters and earthquakes, this isn’t as much of a problem, but in third-world countries that lack resources and proper building planning, this seriously becomes an issue.

History

The use of springs under house foundations for storm protection is a fairly new development for solving the global problem of water-related disasters and earthquakes. However, it wasn’t the first way to protect houses; some of the oldest solutions are Ancient roundhouses dating back as early as 800 B.C. These houses worked by letting the wind from storms through and around the houses. The roundhouses worked best for flooding and hurricanes, but not as well for tsunamis and earthquakes. Another ancient solution called Dougong was used in both Inca and ancient Chinese civilisations. To prevent damage from earthquakes, they would build homes and buildings with interlocking pieces that were not connected with mortar, so that they would move freely while keeping the home together to prevent damage.

A. Roundhouses (800 BC)

The oldest known solutions to natural disasters were roundhouses that were used by the ancient Celtic peoples near what is now Ireland and Great Britain. Roundhouses were effective by not having sharp corners, which allowed wind to flow around them naturally instead of hitting the rigid corners and pushing on the foundation.

B. Chinese Dougong (400 BC - 1000 AD)

The Chinese were some of the first people to create an intricate form of technology to make sure that their housing and palaces did not collapse from seismic activity. They created the Dougong, which was a system of interlocking pieces of wood cut to precise measurements so that they would stay together and also let the house move in an earthquake. These wood pieces also prevented the house from collapsing from too much pressure by putting equal pressure on the many pieces of wood.

C. Stilts (Early 20th Century - Present)

The popularity of raised houses on stilts increased drastically in the early 20th century after the use of flexible and low housing became less popular. This design worked by letting water go under the houses instead of just hitting them head-on. This worked well for flooding and hurricanes, but actually posed more of a problem than a solution when it came to earthquakes.

D. Strength Structure (20th Century- Present)

The best way that has been used to prevent houses from collapsing in earthquakes is by strengthening the foundation, walls, and masonry of houses. This works to some extent by helping the house brace itself against the shaking, rather than resisting the shaking, scientists have rather than resisting the shaking, scientists have found that allowing buildings to move with seismic forces is more effective.

E. Base Isolation (21st Century- Present)

The most recent form of technology for earthquake protection is Base Isolation. Base Isolation is similar to our technology; it uses a device with an iron core and iron plates that are in a rubber liner. This absorbs the seismic waves from an earthquake to keep the house from collapsing or being destroyed. It is the current most effective form of safety from earthquakes that one of the components of our project.

Future Technology

The foundation system we are using is a revolutionary way to allow houses to move with the forces applied during storms or earthquakes, while also allowing up to five feet of water flow under the house. To allow this to work, we are using Advanced Shock Absorption (ASA), where we use lightweight, low-cost Aluminum springs and electromagnets to make a house that can withstand a flood when the magnets keep the springs stable, and can overcome an earthquake or other intense shaking when the magnets are released. The magnets will hold the springs in place when there is no earthquake. When an earthquake is approaching, sensors are placed at 5-foot intervals, 10 feet away from the house at the bedrock. When one of the sensors detects an earthquake coming, it will send by an Through-the-Earth Sensor (TTES) to the house and release the magnets, letting the springs under the house absorb the shock, preventing foundation cracks or breaks.

Overview of the Frankenstein of Foundational Protection's Technology

A. Advanced Shock Absorption (ASA)

The technology of ASA will work by using thin Aluminium springs coated with a rust-resistant paint. These will be coiled as tightly as possible to increase the absorption of shock waves. These coils will be above ground and lift the house up around 5 feet to allow flood safety, as well as earthquakes and other disasters. The main goal of the ASA is to supply a cheap, efficient protection system that can withstand many decades and be healthy for the environment.

B. Electromagnetic supports

Electromagnetic supports are being used to keep the Advanced- Shock- Absorption (ASA) devices from moving when there isn't an earthquake. The electromagnetic supports work by having a strong electromagnet on each side of the ASA. When the power is flowing, the electromagnetics will keep the ASA devices from moving from less powerful tremors, such as someone jumping, walking, or falling. The Electromagnetic supports will only be turned off when the sensors -that will be mentioned later- report an earthquake.

C. Through-the-Earth Sensors (TTES)

TTESs are the sensors that we will be using to alert the electromagnetic support system. These sensors will be placed around two feet underground. The TTESs will be made by using an enhanced version of the current sensors, so they will still transmit underground. The way that they will detect the earthquake is by having a small, sensitive piece of metal stuck about six inches under the initial device that will pick up seismic activity. Once these sensors detect an earthquake, they will transmit a signal to a receiver at the house that will turn off the electromagnetic support, ensuring the safety of the house.

Breakthroughs

The prospect of future structures that can survive both earthquakes, floods, and hurricanes, yet remain affordable, easy to construct, and sustainable, has not yet been established due to a couple of key setbacks. The first setback isn't necessarily a hard one; multiple different components of the design, such as aluminium, springs, and permanent electromagnetic supports, all exist. The setback here is simply that none of the components have yet been put together; there could be multiple reasons for this, probably because no one has ever thought about it and instead concocted a different, maybe safer, idea to solve all three main problems with one device.

The largest setback when looking at our design is the Through-the-Earth Sensors (TTES). The technology for sensors that detect earthquakes through seismic activity already exists; the problem is that they must be planted extremely deep below the ground, at bedrock, to pick up a proper signal. To do that, we would require heavy machinery and millions of dollars, millions of dollars for just one sensor when our design requires four. We want consistent results; we would require four separate sensors at intervals around the house, meaning the price, time, and effort are all multiplied by four. There is also the possibility for something underground to disturb the sensor, like an animal or plants, or maybe even a person would forget about the sensor and dig around it, causing underground movement.

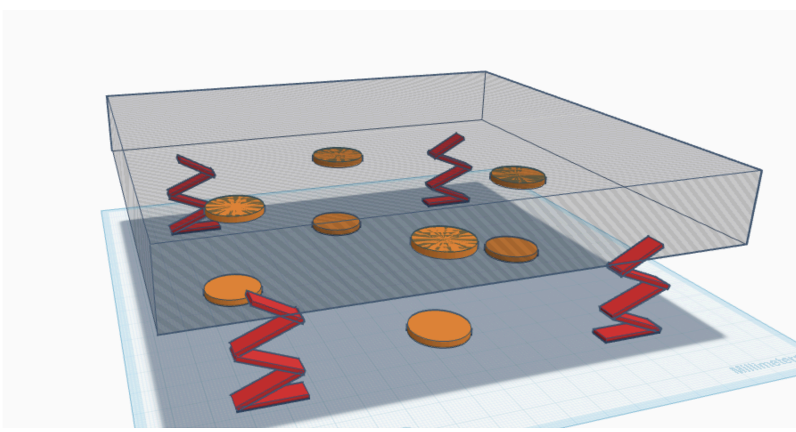
Experiment:

To officially begin our Exploravision project, we need to create an experiment to confirm that the project will defy past limitations we found. The breakthrough we would test in the experiment would be the combination of the materials. Even though these materials are great on their own, they've never been tested together so we wouldn't know if all components would hold up. One large aspect of our project is using transformable springs to prevent damage from hurricanes and earthquakes. To test this, we would need to create an experiment using a miniature model requiring materials such as poster board, a miniature (⅓ scale) 3D printed building, aluminium springs, water, and paper towels. The first testing phases of our project would not be using any electromagnetics or earthquake sensors; we would shake the board on which the home is placed. First, we would need to set up our experiment by placing our mini building, filled with paper towels, on the shake board with the springs attached beneath it, and activate the board to simulate how our model would react during an earthquake. We would take notes during the process and record the different reactions each time it was shaken, noting whether the building was still solid and there was no visible damage. Next, we would pour water on the shake board to replicate a flood or storm to give us an idea of how our model would work during an actual hurricane. We would be able to tell if the home was affected by checking the paper towels in the exterior to see if they are damp at all, meaning the system was not effective. Finally, after reviewing our data throughout the experiment, we could compare the amounts to see what needs to be changed for our final draft of the design.

Design Process

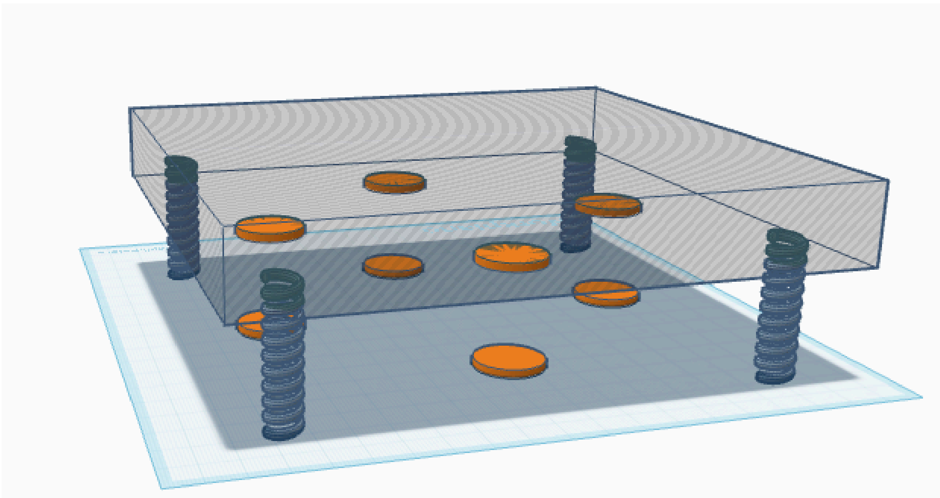
A. Zig zags and magnets

For our initial idea, we designed a building supported by zig-zag-shaped stilts. These springs would have been attached to every corner of the building's base, and the home would also be lifted using magnets with opposite charge. The zig-zag-shaped stilts would've allowed the building to move along with an earthquake instead of trying to resist it. The magnets required would be large neodymium magnets to keep the building from moving during earthquakes.



B. Coils and Magnets

Quite similar to our original idea, in our second design, we still use magnets to help elevate the house, but instead of zig-zag supports, we switch them out for tightly wrapped coils. There were multiple issues with the zigzags. The most prominent issue was simply that being produced incorrectly would cause damage to the home. If the zig zags were made too thin, they would not properly support the home and cause it to fall, and if made too thick, would not allow any movement when an earthquake would happen. Overall, there was too much risk involved in using zig-zag pillars, so we changed them to coils. The coils allow plenty of movement and let the house bounce up and down freely. Also, because the coils would be tightly wrapped, they would give the house support when water came through.

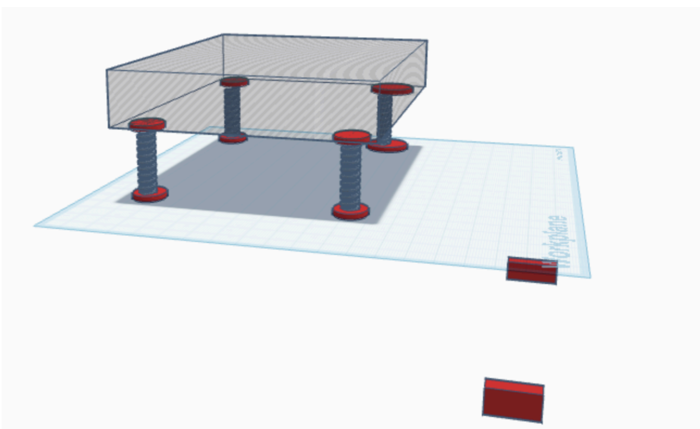


In the later stages of this design, we soon realised that water and movement from the coils would not complement each other well, and the coils would need to be able to transition to normal stilts. We also realised that magnets elevating the house could go wrong in so many different ways, for example, if the house was moved too much, the magnets could shift and possibly become attracted to each other instead of repelling, causing the home to snap to the ground and be very much damaged.

C. Sensors at bedrock with locking coils and electromagnets

Originally, we were going to use magnets to elevate the home, but because that wouldn't work, we transitioned to using the magnets to keep the coils from moving when unnecessary. To deactivate the magnets, we proposed that sensors be put around the house to alert if an earthquake is coming. We started researching how sensors would be able to detect an earthquake. The only earthquake sensors that exist need to be placed at bedrock to get accurate results. These sensors use hanging objects that will only move when an earthquake is moving them. They will ultimately not work because it would cost millions of dollars to put them at bedrock, and one of our goals is to make our technology affordable.

Our sensors use a different form of technology that we call TTE Sensors. These sensors can be put only 2 or 3 feet underground, saving millions of dollars. They work by putting the machine into the ground, and then once it is in, a thin metal rod will stick into the ground. It will be made of a very responsive metal that will alert the machine if there is any seismic activity. The machine will send an alert to the electromagnets to release, letting the coils absorb any shock from the earthquake.



Consequences

A. Positive:

The Frankenstein of Foundational Protection (FFP) is expected to benefit the world by allowing for sustainable and affordable access to safety. There are a multitude of impoverished environments throughout the world, and many of them are prone to earthquakes, floods, and hurricanes. When designing this product, we wanted it to be effective, but also make the device affordable and sustainable for the poor in disaster-prone environments. By using recycled aluminium for the springs, we are not creating more plastic and contributing to pollution. Aluminium is also cheap when buying it recycled and is affordable to process. Aluminium works very well for bending and forming into different shapes. Therefore, for our exact situation, it's the most effective metal.

When looking at the electromagnets, we are using them to close the springs; they are also sustainable and affordable, but not quite as much as a normal magnet. Permanent Electromagnets, which are a newer advancement we are interested in using, are greener than regular electromagnets, only requiring power to turn the magnet off and on, helping to cut energy waste and maintenance. We are trying to make sure that everything we use is sustainable and affordable, but when looking at magnets, the electromagnets may not be the best option. But electromagnets do allow for being turned off and on, making them better suited for our project in the end.

B. Negative:

One of the negative consequences of the FFP is that if something unwanted, such as the rumble from a large truck or a misled animal, moved the sensor rod, it would alert that an earthquake is coming. If that happened, the electromagnets would release all of the coils, and the house would freely move. If the house moved, it might hurt the people and things inside when moving furniture and other objects. Also, if electromagents released and a storm of flood came, then the building would move too much and potentially fall over into the water, damaging the home more than protecting it. If the electromagnets are released for too long, there is also the possibility that the house would tip, making the coils come out of the ground and the house fall and be destroyed.

The coils for our project are made of aluminium, which is a long-lasting material. We are using this to make sure that our creation does not have to be replaced too often. Although this metal is long-lasting, nothing lasts forever, and eventually, the metal will start to break down. This could result in areas with many houses built using this technology having excessive amounts of aluminium in the soil, which could be harmful to the environment. If this happens, there are many consequences, such as stunting root growth, blocking nutrients from plants, slowing cell division, and causing yellowing leaves, which eventually kill the plants and hurt the environment.

Bibliography:

Abhyankar, Shoma. “The Ancient Architecture that Defies Earthquakes - Nautilus.” *Nautilus Magazine*, 28 April 2023, https://nautil.us/the-ancient-architecture-that-defies-earthquakes-301285/. Accessed 13 January 2026.

Used to understand what ancient techniques people would use to prevent earthquake damage to their homes.

Unknown Author. “Welcome to Earthquake Country!” *Earthquake Country Alliance: Welcome to Earthquake Country!*, 2026, https://www.earthquakecountry.org/step4/steepslopes/. Accessed 13 January 2026.

Used to understand what would happen to a house on stilts during an earthquake.

Federal Emergency Management Agency. “Earthquake Risk.” *FEMA*, 25 July 2025, https://www.fema.gov/emergency-managers/risk-management/earthquake. Accessed 12 January 2026.

I used this source to learn about how earthquakes work and how much they hurt human-made structures every year.

Shine, Ian. “This is how we can make buildings earthquake-proof.” *Prevention Web*, 9 March 2023, https://www.preventionweb.net/news/how-we-can-make-buildings-earthquake-proof. Accessed 16 January 2026.

I used this website to learn about the technologies that people are currently using to keep buildings safe from earthquakes.

WSP. “Standing Strong: Engineering Modern Solutions for Earthquake Resiliency.” *WSP*, 20 February 2025, https://www.wsp.com/en-us/insights/2025-earthquake-resiliency. Accessed 16 January 2026.

I used this website to learn about the current sensors that are being used to alert people to earthquakes and how they work.

Kashy, Edwin. “Electromagnetism | Definition, Equations, & Facts.” *Britannica*, Encyclopedia Britannica, 26 December 2025, https://www.britannica.com/science/electromagnetism. Accessed 16 January 2026.

We used this source to find information on how our electromagnetic supports would work.

Veroutsos, Eleni. “The World's 10 Most Earthquake Prone Countries.” *WorldAtlas*, 2025. *WorldAtlas*, https://www.worldatlas.com/natural-disasters/the-world-s-10-most-earthquake-prone-countries.html. Accessed 23 January 2026.

Used to understand what tectonic plates are and how they work as well as what the most earthquake-prone countries are.

Alutrade. “Is Aluminium Better for the Environment Than Plastic?” Alutrade Aluminum Recycling, 2024, https://www.alutrade.co.uk/is-aluminium-better-for-the-environment-than-plastic/. Accessed 20 January 2026.

Used to understand how aluminum compares to plastic and how using it would make our design more sustainable and affordable compared to plastic.

World Population Review. “Natural Disaster Risk by Country 2026.” *World Population Review*, 2026, https://worldpopulationreview.com/country-rankings/natural-disaster-risk-by-country. Accessed 17 January 2026.

Used to understand which countries have a high risk index for natural disasters, most of which are impoverished countries.

Harris, William, and Jonathan Atteberry. “10 Technologies That Help Buildings Resist Earthquakes | HowStuffWorks.” *Science | HowStuffWorks*, 27 February 2024, https://science.howstuffworks.com/innovation/science-questions/10-technologies-that-help-buildings-resist-earthquakes.htm? Accessed 23 January 2026.

I used this source to learn more about how earthquakes actually affect homes and buildings. This clearly showed us how much this was a problem

Innovate Estate Staff. “Designing and Building Disaster-proof Homes for Enhanced Resilience.” *Innovate*, 18 December 2024, https://innovateestate.com/building-disaster-proof-homes/?utm. Accessed 26 January 2026.

I used this source to find out how people are currently designing new technologies for safety from natural disasters. This source also helped me see what was not working about some of the current solutions.

Khachani, Mehdi. “Disaster-Resistant New Construction: Building For Earthquakes, Hurricanes, and Floods.” *JMK Construction and Remodeling*, 25 February 2025, https://jmkcontractor.com/disaster-r esistant-new-constru ctio n/?utm. Accessed 26 January 2026.

I used this source to learn about the newest forms of technology for protecting against all types of disasters.

“New Innovations in Disaster Resistant Housing Technology • Disaster.Shiksha.” *Disaster. Shiksha*, 17 January 2025, https://disaster.shiksha/rehabilitation-reconstruction-recovery/innovations-disaster-resistant-housing-technology/? Accessed 23 January 2026.

I used this website to learn about what scientific principles we would need to use to make sure that the foundation we were inventing worked correctly.

Siddiqui, Sahil. “Architectural Innovations in Disaster-Resilient Structures.” *Design Asia*, 24 December 2024, https://designasiamagazine.com/architectural-innovations-in-disaster-resilient-structures/?utm. Accessed 23 January 2026.

We used this to learn about how other countries worked with the same problem, so we would not just have the U.S.’s opinion on what works and what does not.

“Seismographs - Keeping Track of Earthquakes | U.S. Geological Survey.” *USGS.gov*, https://www.usgs.gov/programs/earthquake-hazards/seismographs-keeping-track-earthquakes. Accessed 16 January 2026.

Used to understand the qualifications for an earthquake sensor to pick up seismic activity.

National Institute of Building Sciences. “Natural Hazards Mitigation.” *Whole Building Design Guide*, n.d., https://www.wbdg.org/do/secure/hazard-mitigation. Accessed 15 January 2026.

Used to find building designs that will reduce damage from natural disasters such as hurricanes.

Fox Blocks. “15 Building Products Designed to Withstand Natural Disasters.” *Fox Blocks*, 2024, https://www.foxblocks.com/blog/15-building-products-designed-to-withstand-natural-disasters. Accessed 15 January 2026.

This source explains building designs that can help structures survive any natural disaster.

Marshall, Chris. “Architectural Solutions in Resilient Construction.” *Trusscore*, 22 March 2024, https://trusscore.com/blog/architectural-solutions-in-resilient-construction.html. Accessed 16 January 2026.

Used to find how you can make a building more stable to withstand a natural disaster.

~The Frankenstein~

Of Foundational protection (FFP)

The world suffers from over 300 natural disasters each year, including earthquakes, tsunamis, hurricanes, and more. These disasters affect over 2 percent of the world each year and kill as many as 60,000 people. Our foundational protection system uses springs, electromagnets, and earthquake sensors allowing homes to withstand earthquakes as well as floods and hurricanes. Our solution is also perfect for impoverished environments because the materials we are using are affordable and accessible as well as remaining sustainable.

Current Technology | Design Breakthroughs | FFP Overview | World Wide Impacts

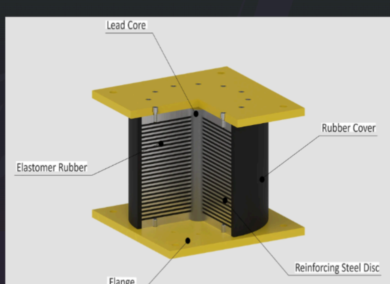
Current Technology

There are many useful present forms of technology for natural disasters, but the most effective and common ones for earthquakes and hurricanes are: Base Isolation, Hurricane-Resistant building designs, and Stilts.

Earthquakes

Base isolation

Base isolation helps reduce the shaking of an earthquake to keep people and buildings safe. A building is placed on top of rubber or steel pads between the ground and the structure. The shaking is prevented through the pads absorbing most of the movement's shock.



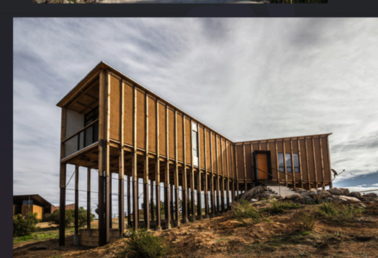
Hurricanes

Hurricane-Resistant building designs:

Hurricane-Resistant building designs are an effective solution involving reinforcing the walls, doors and windows with steel or other strong materials such as wood. These designs help keep buildings safe from strong winds and heavy rain during hurricanes. Homes can also be built in round shapes allowing for wind and and water to flow around preventing damage.

Stilts:

Stilts keep the house raised above the ground so that floodwaters will go under the house instead of flooding and damaging the house.



DESIGN BREAKTHROUGHS

EARTHQUAKE STILTS

One of the problems associated with housing built on stilts is that they don't withstand earthquakes well. While the elevated house allows water to pass underneath, avoiding water damage, if the environment in which the house is built is also prone to earthquakes, the stilts could easily break, causing even more damage to the home than the flood or hurricane alone. In countries such as the Philippines, Chile, and Pakistan, which are all prone to water-related disasters and earthquakes, this could very easily become more of a problem than a solution.

DECAY

Normal wooden stilts could also easily decay over time due to factors such as termites, material degradation, or moisture entering the wood over time, causing it to rot. There have been many attempts to replace the wood with steel or concrete, but even then, these materials eventually deteriorate. Once the material decays, there are many places all over the world that would struggle to replace those resources financially, let alone purchase them in the beginning.

BUILDING PROCESS

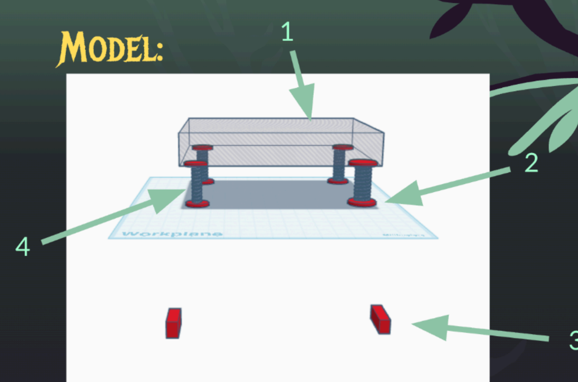
The last large problem with stilts is that when built improperly, it is possible that the home's foundation could crack, shift, or settle. If the stilts are too thin or thick they could cause many more unnecessary issues. In more financially stable countries that struggle with water disasters and earthquakes, this isn't as much of a problem, but in third-world countries that lack resources and proper building planning, this seriously becomes an issue.

Current Technology | Design Breakthroughs | FFP Overview | World Wide Impacts

FFP OVERVIEW

1) Number 1 is the home's base. It would be a connected part of the house and would support the house using stilts.
2) Number 2 are the electromagnetic supports being used to prevent the stilts/springs from moving when there isn't an earthquake. The electromagnetic supports work by having a strong electromagnet on each side of the springs. When the power is flowing, the electromagnetics will keep the springs from moving from less impactful movement such as someone jumping, walking, falling, or even dancing. The Electromagnetic supports will only be triggered to turn off by the (soon mentioned) earthquake sensors.
3) Number 3 are the sensors that we will be using to alert the electromagnetic support system. These sensors will be placed around two feet underground by the homeowner. The sensors will be an enhanced version of what already exists just meant for shallow soil instead of bedrock. The way that they will detect the earthquake is by having a small, sensitive piece of metal stuck about six inches under the initial device that will pick up seismic activity. Once these sensors detect an earthquake, they will transmit a signal to a receiver at the house that will turn off the electromagnetic support allowing the springs to activate, ensuring the safety of the house.

MODEL:



4) Number 4 are thin Aluminium springs coated with a rust-resistant paint. These will be coiled as tightly as possible to increase the absorption of shock waves. These coils will be above ground and lift the house up around 5 feet to allow flood safety, as well as earthquakes and other disasters.

Current Technology | Design Breakthroughs | FFP Overview | World Wide Impacts

World Wide Impact

Safety

The Frankenstein of Foundational Protection will help people across the world to stay safe in earthquakes, floods, and hurricanes. This technology will keep housing from breaking in earthquakes, flooding, and from hurricanes. This foundational design will help prevent damage in multiple scenarios unlike any other prevention.

Prevents

ASA

ASA stands for: Affordable, Sustainable, Accessible. These are three of our main goals other than safety for our project.

Affordability

We are attempting to make our foundational technology affordable by using cheaper materials, such as recycled aluminum. When developing new sensors we will also make sure that they are made with easily found, affordable materials.

Sustainability

By using recycled aluminum we are keeping our design sustainable. We are also giving the option of using permanent electromagnets which are a newer advancement and are greener than normal magnets. But they can be more costly therefore we are going to make them optional over normal electromagnets.

Accessibility

We are also trying to make our technology accessible through the earthquake sensors which will be buried by the home owners meaning there would be no need for a construction crew. This design being affordable also implies that it will be accessible to impoverished countries which struggle with these disasters a lot.