

THE INNOVATION OF MLH (MAGNETIC LEVITATED HOUSE) AS AN ALTERNATIVE SOLUTION TO OVERCOME EARTHQUAKE AND OTHER NATURAL DISASTERS

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1. Introduction

Indonesia is one of the countries that most vulnerable to natural disasters, because geographically Indonesia is located at the meeting of three world plates, namely Eurasia, Indo-Australia and Pacific ^[1]. It causes some of areas in Indonesia potentially is affected by a huge earthquake with strength above 5 Richter Scale. The Geological Department of The Energy and Mineral Resources reported on April 2016 that those earthquakes which have occurred in Indonesia in the past few months have trigger geologically due to the dynamics of the earth's layers. An Earthquake that occurs on the 7th Richter Scale has an adverse effect to take a lot of casualties and damage. According to the Head of the Information Data Center and the National Disaster Management Agency (BNPB), most of the victims killed by collapsed buildings ^[3]. Thus it has been proven that the construction structure of earthquake-resistant buildings become the most important factor in order to avoid enormous adverse impacts on our environment, infrastructure, economy and our survival as human beings ^[12]. Even though we can not avoid those natural events, we definitely must keep trying to find solution for those problems, This research uses the Technology of Magnetic Levitation equipped with bamboo house construction and Dynamic Seismic Isolation System (DSIS), in the hope of increasing the percentage of safety in saving our homes and life from earthquake and other natural disasters.

2. Experimental Design

Magnetic Levitation is the ability of a magnetic force to create zero gravity or certain condition that against the earth's gravity. It can make object floating in the air without making any contact with anything solid. In this study, we do not use electromagnet force as power supply for levitating, because it cause health risk and hazards for living organism, but we use the pure magnetic force of Ring Neodymium ($\text{Nd}_2\text{Fe}_{14}\text{B}$), based on its advantages such as ^[5] : (1). World's strongest permanent magnet because it is iron boron magnet that has approximate magnetic properties of residual magnetic induction from 1.08 T up to 1.5 T and intrinsic coercive field strength of 875 kA/m to above 278 kA/m. ^[6], (2). High resistance to demagnetization, (3). Its energy will never run out and does not require power supply, (4). Good at low temperatures though decrease in strength under $-138^{\circ}\text{C}/-216^{\circ}\text{F}$, (5). Efficient in energy, cost, and environmentally-friendly. The manufacturing process was conducted by following the steps below:

1). Build Magnetic System as a base at the beam.

- Build concrete beam as a base at grade (ground-level) and wooden beam as house's foundation (upper-level). The round base shape is ideal for structural and strength, furthermore technically, operationally, and economically are satisfying in balance. Use diamagnetism material as a base of magnet suspension and core to make magnetic field remains stable.

2). Attach Conductor Magnet on the entire edges of the beam

- Facing those two beams side by side by exposing two similar poles, so they will REPEL and PUSH to each other

3). Make a Central Support for Axis

- Build DSIS which is equipped with steel wire spring and regupol to reduce vibration under the ground and install a strong wooden axis on steel wire spring up until it penetrates the construction of the upper-level to keep it balance, stable, and focus in one point symmetrically from magnetic field and gravitational influence.

4). Stabilized the System

- Set it until the position is right and stable. The wooden beam will be pushed up by lower concrete beam, and when the above beam has the same force with the lower beam, it will reach the balancing point to stay still and levitate. The lifting magnetic force that points upwards will be opposite to the gravity of the object that pointing downward due to the earth's gravity. The system can even rotate if we needed.

5). Build Bamboo House ^[8]

- Bamboo house is the best alternative because it is lighter, flexible, sustainable and strong which is an important parameter in this practical application to maximize the function of magnetic force system perfectly

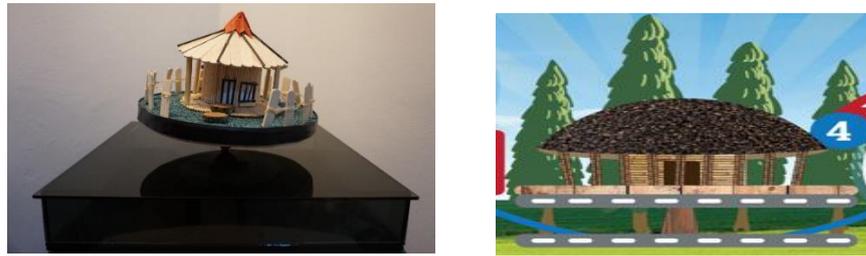


Figure 1. Prototype of Magnetic Levitated House

3. Result

The lifting force of magnetic repulsion completed with Magnet Levitation Technology, DSIS and Bamboo House Construction can be an alternative solution to elevate house which can reduce the impact of the ground movement. The system has a greater chance of success to be able to survive from the possibility of damage and injury from the collapsed building. In addition, the system is cover the earth's surface measly so hopefully can restore the sustainability of soil function as the lungs of the earth. Figure 2 and 3 proves that the construction with the system can survive when Vibrometer showed VII-VIII scale.



Figure 2. Standardized Vibration Test

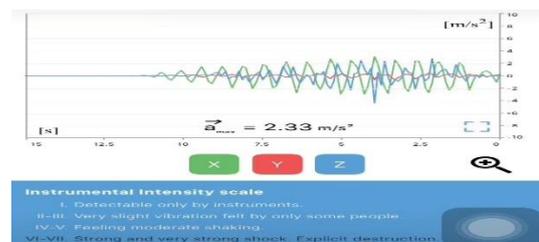


Figure 3. Instrumental Intensity Scale

4. Conclusion

Magnetic Levitated House is an infrastructure system technology that could be developed to survive from earthquake and other natural disasters. The system can be located at any area supported, needs a minimum amount of land, most of the base floats in the air so does not cover the land extensively, and eco-friendly without disturbance to the existing land, water, and wildlife movement. However, the balancing of the system still needs to be improved for stabilizing the gravitational force.

5. References

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