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# EARTHQUAKE RESISTING STRUCTURE USING SEISMIC CLOAKE

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*Abstract*: **Structures are subjected to an earthquake excitation, it interacts with the foundation and soil, and thus changes the motion of the ground. It means that the movement of the whole ground structure system is influenced by the type of structure as well as type of soil such as dense soil, medium and soft soil. Different soil properties can affect seismic waves as they undergo a soil layer. the study of seismic resisting foundation with its analysis, the behavior of surrounding soil and the designed foundation, feasibility and its implementation. The behaviour of seismic waves throughout the soil layer and designed foundation will be comparatively studied and analyzed by simulation modeling. The designed foundation will be in the form of rubber plates. The high vertical stiffness achieved by having thin layer of rubber reinforced steel plates, which has the ability of elastoplasticity which reduces the seismic effect. Hence we are comparing the structure with rubber sheet footing structure.**

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## I INTRODUCTION

The problem of earthquake cannot be over emphasized. More than about 60% of the acreage is taken into account susceptible to shaking of intensity VII and above (MMI scale). In fact, the whole Himalayan belt is taken into account susceptible to great earthquakes of magnitude exceeding 8.0, and during a short span of about 50 years, four such earthquakes have occurred:1897 Assam (M8.7), 1905 Kanga (M8.6), 1934 Bihar-Nepal(M8.4), and 1950 Assam-Tibet (M8.7).Proper design of a foundation against earthquake loading requires through understanding over the behaviour of soil, response of structure and interaction of soil-structure under earthquake loading. If a building's foundation sits on soft or filled-in soil, the entire building may fail in an earthquake no matter the advanced engineering technique employed. Assuming, however, that the soil beneath a structure is firm and solid, engineers can greatly improve how the building-foundation system will answer seismic waves. For example, earthquakes often knock buildings from their foundations. One solution involves tying the foundations the building so the whole structure moves as a unit.1.

### A. HISTORICAL STUDY

### 1.1 Sub Heading 1

The first major initiatives for earthquake resistant constructions emerged after the Baluchistan (now in Pakistan) earthquakes of the 1930's. After the Mach earthquake of 1931 (M7.4; intensity VIII on RF scale), about 60 km from Quetta, formal earthquake resistant construction was administered within the region for the railways. S.L. Kumar, the young railway engineer who designed these constructions, documented this work (Kumar 1933), provided the primary seismic zone map of the country and suggested seismic design coefficients. In the 1935 Quetta earthquake (M7.6; intensity upto X on RF scale; about 20,000 dead), the earthquake-resistant railway quarters located within the area of maximum damage were the sole houses that remained undamaged. Clearly, the 1935, Quetta earthquake was interesting from several viewpoints. For the primary time, serious and systematic efforts were made within the country at earthquake resistant constructions and for developing earthquake codes. More importantly, for the primary time in India, efficacy of earthquake resistant constructions was tested during a severe earthquake. The evolution of the supply of ferroconcrete bands at plinth, lintel, and roof levels in masonry buildings happened after this earthquake. In fact, the actions taken after the 1935 Quetta earthquake provided the model to be recommended for other earthquake-prone regions of the country. The concrete industry developed an early interest in earthquake engineering. The Indian Concrete Journal brought out a special issue (ICJ, 1934) on the 1934 Bihar-Nepal earthquake with excellent well captioned photographs. After the Anjar (Cutch) earthquake of 1956, two articles (ICJ, 1956a; ICJ, 1956b) were published within the same journal outlining the planning principles of earthquake-resistant buildings. A monograph on earthquake resistant buildings was published in 1954 which was revised in 1958 and 1965 (CAI, 1965). School of Research and Training in Earthquake Engineering (now Department of Earthquake Engineering, DEQ) was set up at

Rookie in 1960. The important research projects undertaken at Rookie in the early years include: lateral resistance of masonry walls and enclosures, development of indigenous strong motion instruments, and studies on liquefaction. Research aboard isolation of masonry buildings was conducted at DEQ as early as 1970's. Several innovative experimental set ups were developed at Rookie to conduct research, including a two-dimensional shake table. DEQ provided earthquake engineering consultancy for major dams and atomic power plants; as an example , the Narrow nuclear power plant located on a site with deep alluvium (zone IV) and the rock-fill dam at Teri in the Himalaya (zone V).

## II LITERATURE REVIEW

1. The Cloaked foundation technique was developed to test its ability to act in case of a quake is struck to a structure and finding the results of the test which turned out to be a good one. The technique adopted resisted the effects of vibrations to certain extent thereby minimizing the hampering of the stability of the structure. By ANUP SHELAR and MIRAJ THAKER.
2. Sushil R.Lipte,Dr. V. R. Rathi-The software investigation of base isolation compared with fix base, generally while analyzing structure we provide fix support for the foundation over here isolator are used instead of fixed base and compared. These are compared for base shear, story drift, story acceleration, displacement, reaction etc. In this study, a comparison is made of the seismic response of a G+7 & G+14 story baseisolated building by idealizing the superstructure as rigid and flexible. In this work the Lead Rubber Bearing (LRB) isolation system is considered. Two different heights of buildings low and medium rise in zone V is considered. For such analysis ETAB software was used. 3 bay G+7 & G+14 story structure was analyzed for dynamic earthquake using response spectrum method. The results obtained are Story drift, Story acceleration, Base shear, Lateral displacement, Reaction at base. This paper intends to demonstrate how an isolation system can be efficient, evaluating its effectiveness for the building in terms of story acceleration, base shear, story drift and story displacement reductions.
3. The seismic metamaterial is an application of the cloaking of objects to shielding of buildings and large objects from seismic waves. This enables the bending of seismic waves away from the structures. The detailed theory and adaptation to the required situation are given. This is an example of the scaling up the capability of the acoustical met materials from nano meter size to building scale. BYWOON SIONG GAN
4. Convert the earthquake's movement energy into a less harmful form. Designed a system of subterranean perforated concrete cylinders that would resonate when struck by surface waves. "It would be like thousands of underground concrete saxophones being played with seismic energy," explains Kim. For a magnitude 8 earthquake, Kim and Das calculate that their underground saxophones would produce a 160 decibel roar – equivalent to the noise level of a shotgun äring. However, the structures would have to be impractically large – perhaps 100 meters long. By Sang-Hoon Kim.
5. Earthquake-resistant design to support conventional a seismic system using acoustic metamaterials. The device is an attenuator of a seismic wave that reduces the amplitude of the wave exponentially. Constructing a cylindrical shell-type waveguide composed of many Helmholtz resonators that creates a stop-band for the seismic frequency range, we convert the seismic wave into an attenuated one without touching the building that we want to protect. It is a mechanical way to convert the seismic energy into sound and heat. By **M**ukunda Das.

## III CONCLUSIONS

For building with base isolation, its displacement is fluctuate for every story. Displacement of Irregular Building in plan with base isolation is reduced by 90% as compared to without base isolation. As weight of the building increases, the design base shear also get increase hence we conclude that weight of building is directly proportion to the Design base shear.

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