

## Experimental on the Residential Building of Earthquake using Shake Table Test

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**Abstract-** This work illustrates analysis's research based on Shake's Tables Tests. Such Shakes Tables are equipments with the help of that real earthquake's condition data's, force along vibration on structures might notice, record along study. If any earth-quake occur in any areas that lead related pauses day today's life's, huge damage, loose of living being live along failures of structure. In my work, models are mounts over shakes tables & vibration were records. The L.S. Designs criteria are consider from I.S. 456:2000 as well as for Seismic analysis Loads Combinations are consider related to I.S. 1893(PART-D):2002.

### **I. INTRODUCTION**

This globe consists of 4 different layer. Inner core's that was inner-most layers of earth's follow by above layers named as outer-cores than mantles regions that are semisolid's in nature's & crust is upper most layers where mankind dwell being thin parts consist of tectonic plate. These were of two type of crusts first known as oceanic crusts that was lies down ocean's whereas other's one was continental crusts form because of crash of tectonic plate for examples such as Himalayan mountain.

Earthquake is natural and even man-made phenomenon. These were devastating along natures. Man-made earthquake is because of mining's activity along nuclear bombs on the other hand natural disaster may not be predict & were cause where 2 tectonic-plate slide over each other's and collide with each other. Energy stored with in them break out or reach to earth's surfaces with epicenters as seismic wave which cause ground's to shakes or lead to destructions. Post earthquakes the structures become debris's or are imp. Along with challenge works for Civil engineers to re build such structures even to designs such structure that may reduce effects of earthquake as future's disasters. In my work I will illustrate about models considers as substitutes models of a seismic-isolated structures with use of Shakes Tables used at the require intensities.

### **II. SHAKES TABLES**

The first's shakes table is invent in Japan (1890), in Japan people mount models on surfaces that were attach along wheel & is experiment on rails tracks. In Japan this was widely use and imp. of this Shakes Table was that it was use in modern era to stimulates earthquakes responses. The model's that subject to similar responses as earthquakes, vibration on such models was generates in X & Z direction after that reading was record & even manually calculate. The experiments might perform on heavy structure along on small models depend upon numerous types of Shakes Tables may utilized.

Type of Shakes Tables:

1. Uni-Axial's
2. Bi-Axial's
3. Multi-axial's

#### **1) Uni-Axial Shakes Tables**

It is use related to small scales experiment to notice responses of structures if subjects to earthquakes vibrations. This also use as based plates where models are shaken along driven by electronic servo actuator. Such table's sizes vary from 0.5m X 0.5m, 1m X 1m, 1.5m X 1.5m, 2m X 2m. Capacities of table's frequencies were high then 101 Hz whereas load capacities may lies in 50-10000 Kg. The system consists of digital controls and data acquisition to connect transducer. This was simple to

insulate and it even not requires skill labors.



Fig. (a) Uni-Axial shake Table

## 2) Bi-Axial Shakes Tables

This Table's record seismic activities related to structures but may be best options if it compared with Uni-Axial Shakes Tables because tables provide movements in both X along Z directions. This tables size lies in 0.5m X 0.5m, 1m X 1m, 1.5m X 1.5m, 2m X 2m, 3m X 3m.



Fig. (b) Bi-Axial Shake Table

This was drive from hydraulic actuator have loads carry capacities nearly 50-10000 kg and frequencies high then 100 Hz. This was also notice easy to installed along use friendly. This was design to carry more intensities loads along frequencies. With helps of hydraulic actuator movements in X & Z direction was controlled. Such experiment may conduct in lab using such tables.

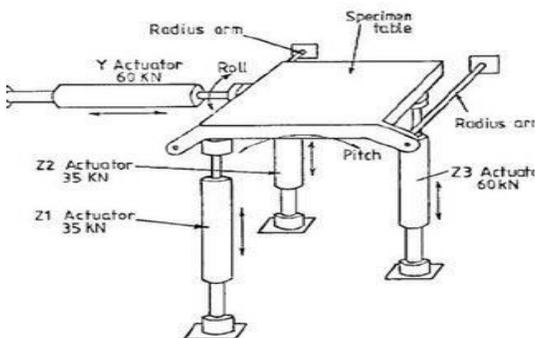


Fig (c) Bi-Axial Shake Table

## 3) Multi-Axial Shakes Tables

Multi-Axial Shakes Tables help to analysis real's times earthquakes seismic activity on modular's structures. This also provides 6 axis of motions along appropriates as usage as it use high numbers of digital acquisitions to records such seismic activity, displacements along frequencies. Size of such tables may 5' X 7' whereas frequencies vary as 0.01 – 50 Hz, displacements vary up to 250mm. this was hydraulic driven actuator, require least maintenances even easy installations.



Fig (d) Multi-Axial Shake Table

## III. LITERATURED REVIEWS

Such wood plates were use as based plates of sized 1.5'x1.5' attach with spring at each corner and such models were mount over this. Shakes Tables was attach with volcano's meters along sensors to check vibration. The seismic activities were record with digitizers or numbers of vibration, accelerations along frequencies is recorded. Two comparisons of such models were made with least along high frequencies on Shakes Tables. Such Linear Variable's Transformers (LVDT) was use to measure displacements of such models. Such tests include Shakes tables was one of way with help of which seismic research may carry out as well as at more frequencies such models show displacements of 10mm at 0.115 sec and at least frequencies the displacements were 11.4mm at 1.55Hz. This even includes Shakes tables may runs on Sine's wave and By Waves form.

Such model's is kept over Shakes Tables where as artificially seismic wave was generates. Movements of such building were record at numerous times interval along results include that more strengths concretes may provide along joint. This model is able to resists 75% of vibrations. Such experiments is carried on reinforced concretes structure of least strengths concretes and because of less strength concretes structures resemble crack in the tests whereas ultimately models collapse if frequencies of such shakes tables were increase.

This illustrates that seismic damper were best during noticing shock generate in earthquakes. Such risk of

disasters become least if compare to structure without bases isolations hence bases isolations method was boon in structures. The experiments were done by use of Horizontal Shakes Tables of sizes 700 mm x 600mm as well as pay loads was of 5-6 kg and frequencies of 1-10Hz. Two model of G+4 was experiment with damper and without damper in similar times periods of 30seconds.

Such buildings show deflections in X and Y directions as well as deflections in buildings without damper were high prone to earthquakes also models with damper showed least deflections. So damper may use as shocks absorbers in buildings floor to resists such earthquakes vibrations and safeguard the structure.

#### IV. BASED ISOLATOR

Normally bases isolations methods are one of way with help of which seismic activity may minimize & numerous type of bases isolations system were present. In such base isolations techniques the buildings were attach as roller, slider, rubber's plate and led's rubbers bearing so that it can absorb energy's.

Such structures were fixe with based are high prone to earthquakes if compare to buildings as bases isolator. Such mechanisms of bases isolator were absorbed shocks wave generate in earthquakes. Such bearing were provide in bases to structures b/n superstructures along foundations.

In such earthquakes bearing decouple with structures along vibration were absorb in rubber bearing along buildings with shake whereas risks of collapse of buildings was avoid whereas even living being live was even save. Bhuji's Hospitals, Gujarat's was one of examples Based Isolations Systems even it was first's structures that is use in India's.



**Fig (e) Base Isolation System**

#### V. LOADS-BEARINGS VALUES OF SOILS

Loads bearings soil was that withstanding strengths of loads if apply on that. Acc. to I.R.C. (International's Residential Codes) every soil's have their own property; loads carry capacities depend on types of soils.

**TABLE I. LOADS BEARINGS VALUES OF SOILS**

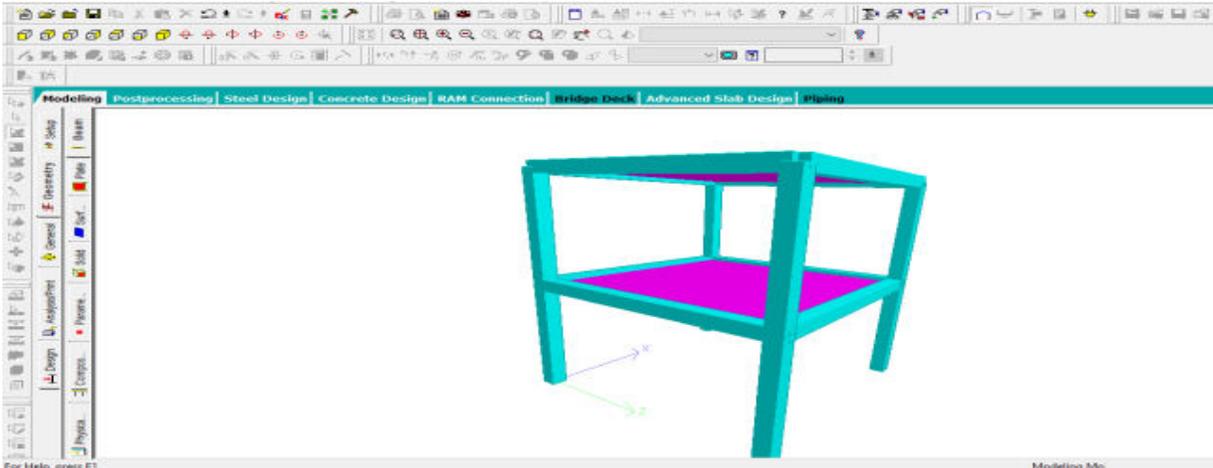
Types of soils	LBV Per squares foots
Bedrocks	12001
Sedimentary Rocks	4001
Sandy Gravels	3001
Sands, Silty sands, Clay sands	2001
Clays, Sandy clays, Silty clays	1501

#### VI. RESULT & DISCUSSION

Such model's is design acc. as mentioned data's shown in codes books of L.S. of Designs. Such loads combinations along seismic loads in codes books I.S. 1893(PART-I) 2002 was taken. The Uni-Axial's Shakes Tables was use for experimental along for models G+2 was consider.

##### ➤ MODELS DIMENSIONS

Beam's Sizes	235mm x 370mm
Column's Sizes	305mm x 405mm
Floors Heights	3.3m
Live + Dead loads	7.6 Kn/m <sup>2</sup>
Wall's loads	13 Kn/m <sup>2</sup>
Parapet's loads	6 Kn/m <sup>2</sup>
Types of Zones	IV
Zones Factors	0.34
Soil's Types	Mediums



## VII. RESULTS

Accelerometer was kind's of transducer that use to controlled shakes tables along observing responses of structures. Such tables represent about lateral's displacements of models with bases isolations along without bases isolations at fix times.

**TABLE II. MODELS DISPLACEMENTS WITH BASED ISOLATIONS**

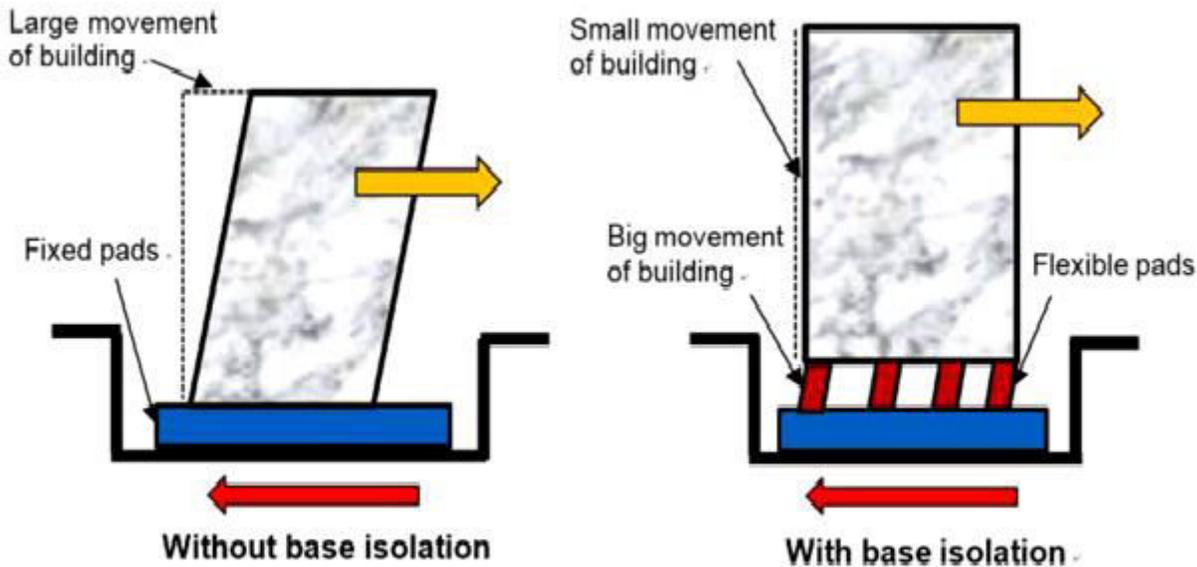
Stories	Lateral's Displacements ( in mm)		Frequencies (Hz)
	X	Z	
1 Floor's	13.3	6.8	2.1
2 floor's	14.5	11.5	2.5

Such tables represent laterally displacements of buildings in X along Z directions with Based Isolations.

**TABLE III. MODELS DISPLACEMENTS WITHOUT BASED ISOLATIONS**

Stories	Laterally Displacements (mm)		Frequencies (Hz)
	X	Z	
1 Floor's	16.7	11.1	2.5
2 floor's	16	12.1	2.5

Such tables show about laterally displacements in models in X along Z directions without Based Isolations.



**Fig (f) without base isolation and with base isolation**

## VII. CONCLUSIONS

Such experiments illustrates about based isolations was best ways to safes safeguards in buildings against earthquakes along pad may consist of leads, steels and rubbers. Such Shakes Tables was methods of experimently by which seismic vibration may study along study in experiment purpose. There were numerous damper such as viscous's, vibration, oils that may use to absorbed such seismic-wave. Shear wall, moments resist frame, diaphragm along cross brace may use to resists earthquakes movement. Wood's are even substitutes as ductile in nature even easy to use. Depends on regions along types of soils such constructions may done. In hill region slopes may consider even regions where soils are least in strengths piles foundations may be adopt. Light weights materials may be use in earthquakes prone area along heights may be choose least.

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