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Experimental Analysis of Earthquake Shake Table

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ABSTRACT: *Seismic activity being major consideration in the design of a structure is to be analyzed and this paper reveals the analysis of seismic activities which is reduced in size for experimental value. The table made of wooden material is being used for seismic analysis. The observations are contained as resulted. The concept of shake table provides the stability on application of it in structure against earthy movements. This table is a tool in Architect which monitors the motion of the earth and its effect. This paper opens up the need of consideration of seismic activities and its solution to its best.*
Keywords: *Seismic Analysis, Teaching tool, Seismic Modeling.*

I. INTRODUCTION

In major part of structures, the table gains its own position in resolving seismic activities. The major part of this paper rules about the current experience showing several test about the different type of structures which can be succeeded by simulator called LNEC 3 D (type of earthquake simulator) (Sanghvi et al., 2012) states the data sampling rate of accelerometer is 640 samples per second and the sampling rate of LVDT is fifteen samples per second, with this sampling rate we are able to achieve acceptable results with maximum variation of 9.57%, (Rogerio Bairrao et al.,2000) in theirs experiment they gained some experience with the operation of the LNEC 3 D earthquake simulator-such as test setup, signal acquisition and processing; the advantage of having the mass associated to that inertia forces located out of the simulator seems to be unquestionable from several points of view. To resolve the impact of it on structures the cause limit has been studied. Pre built model is used to test its natural occurrence and behavior. The observations are noted. The behavior of civil engineering structures is assessed using shake table since sixties. The use of seismic table should be increased in today's life. The research is mainly based on steel characteristics, structures like RC buildings, and also its elements. (Sandra Brown 2007) proved the following in the research work; when running a sine wave 1HZ the accelerometer on the shake table sends a 1HZ wave form back into the computer and also it is more evident in data files taken from the lower second and third floors where there is less variation in the wave forms.

II. DEMAND OF SHAKE TABLE

Health care facilities may undergo severe and wide spread damage that impairs functionality of the system when it is stricken by an earthquake. Such a detrimental response is emphasized either for the residential buildings or for industrial buildings. Moreover these buildings need to warrant operability. A limited number of experimental tests have been carried out so far on building components. The impact of earthquake threats the biodiversity, altering the present circumstance. In such a case the residential buildings must be analyzed for earthquake response. The limited number of experimental test carried out on buildings necessitates the demand of shake table**.** The experimental test is carried out considering the future which we thrust by this paper. In our creative point, the shake table must be provided at the center and corner of the building to safeguard the structure from earthquake. Shake table lists among the valuable tool at present.

III. METHODOLOGY

Our Methodology is based on vibration effects, to obtain test on shake table. The test shows the seismic responses over the rough surface and also provides the data about how the earthquake can occur.

IV. SCOPE AND OBJECTIVES

In the year of 1995, the study shows the failure in the RC columns and it is named as kobe earthquake (Pierre Quennevilie et al.). Clarify the effectiveness of seismic retrofit which standardized the measures for

existing RC columns. Those columns can be designed with the current design and also current requirements and all comes under motion design. The requirements of this design must be stronger when compared to today's design of motion. The new technology of damper and its causes is clarified.

V. GG SCHIERLE SHAKE TABLE

The Schierle Shake Table is a motion of shake table, which shows one degree. The shake table includes:

- ✓ Steel frame
- ✓ Computer
- ✓ Suspended aluminum shaker platform
- ✓ APS systems Electro- semis 113 shaker component
- ✓ Digital/analog converter
- ✓ Amplifier component is Model 114

The Schierle Shake Table accepts the input in the form of electronic basis by a system called digital analog converter, in the controlling computer, having some components. It allows +/- 2 volts from a DAC and provides the voltage up to 280 volts, maximum, and 5 amperes are amplified to 7amperes. This table provides the limit state for rooms, like safety and also for certain curves by the way of certain approach.

VI. PROCEDURE FOR FIXING THE SHAKE TABLE

The size 2 ½ ft x 2 ½ ft plywood table is fixed at the bottom. By means of using heavy weighted iron springs. The shake table dimension is of 1 ½ ft x 1 ½ ft. This shake table is connected with volcano meter where the drilling machine is inserted into the meter which produces the vibrations. Then the sensor is fixed for the analyzing the vibrations, after contacting the manufacturer of the shake table and amplifier. The manually done shake table gives some helpful guidelines, such as the amplifier would only accept a +/- 2 volt input. And the frequency meter is also fixed along with the table to identify the frequency and also the sine waves can be analyzed using the CRO meter. By this shake table experiment we can identify the number of vibrations, number of acceleration and frequency for the small scale building.

VII. DESIGN FOR SHAKE TABLE

Table 1 Natural frequency calculation for the build model

S.NO	DESCRIPTION	DIMENSION	UNITS
1	Vertical rods		
	a)width(x)	3	Mm
	b)depth(z)	3	Mm
	c) Ixx	80	mm^4
	d)Izz	80	mm^4
2	Top plate thickness	2.5	Mm
3	Density of steel A304	3287.241	Kg/m^3
4	Elasticity	11000	Mpa
5	Height of the structure	270	Mm
6	Lateral stiffness		
	$K = 4^*(3EI/L^3)$ N/m	1414.62	N/m
7	Dimensions in x direction	224	Mm
8	Dimensions in z direction	224	Mm
9	No. of columns	4	Nos
10	Mass of structure		
	Top plate	3.15	Kg
	Vertical rods	0.32	Kg
	Extra for nuts /bolds	0.14	Kg
	Total lumped mass m	345	Kg
12	Omega ω		
	$\omega = (k/m)^{0.5}$	9.65	Rad/s
13	Frequency f		
	$f = \omega/2\pi$	2.99	Hz
14	Natural period (T)	0.114	Sec

VIII. FUNCTIONING OF THE MODEL:

The USGS is an instrumentation which was built as prototype, which is based on the model. The seismic activities is to be recorded by the digitizer and the testing was done in our college building for our study purpose.(Tian Chunyu et al.,2012) demonstrated that, for the scaled model test, reasonable design and fine construction of test model is very important. Analysis should be carried out during model design to verify that the test model and prototype structure are in conformity with the similitude theory and the experimental results on the scaled model can be revealed the seismic performance of prototype structure.

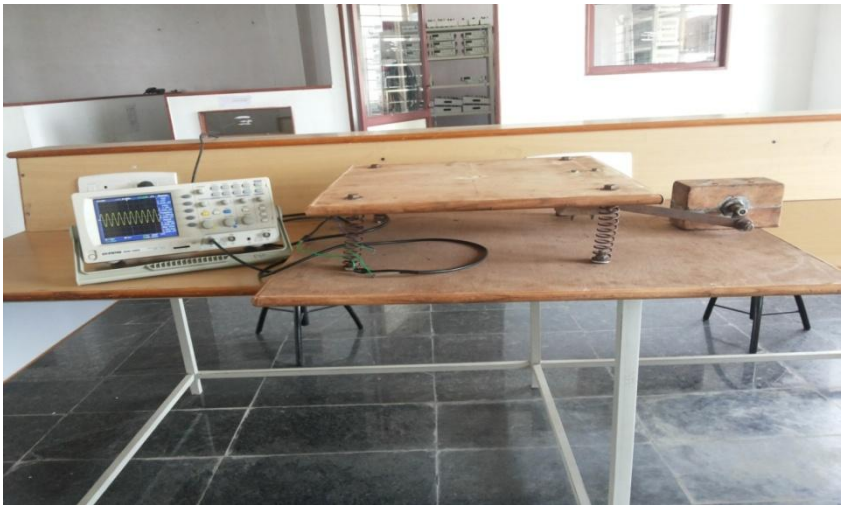

Figure 1 Shake table connected with CRO meter

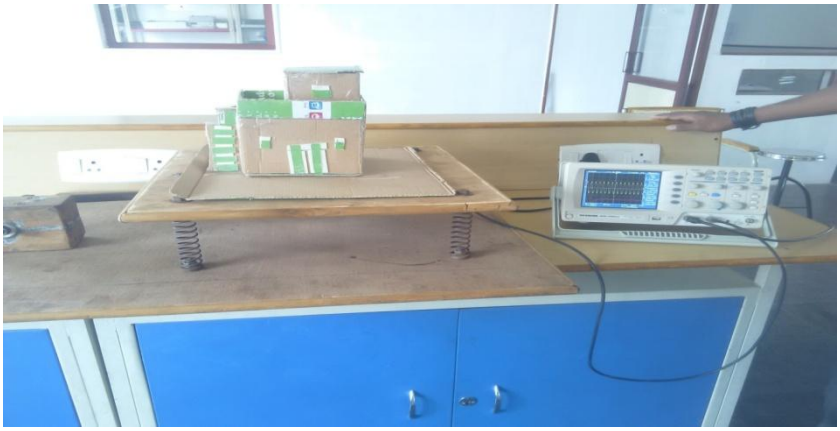

Figure 2 showing the results in frequency meter

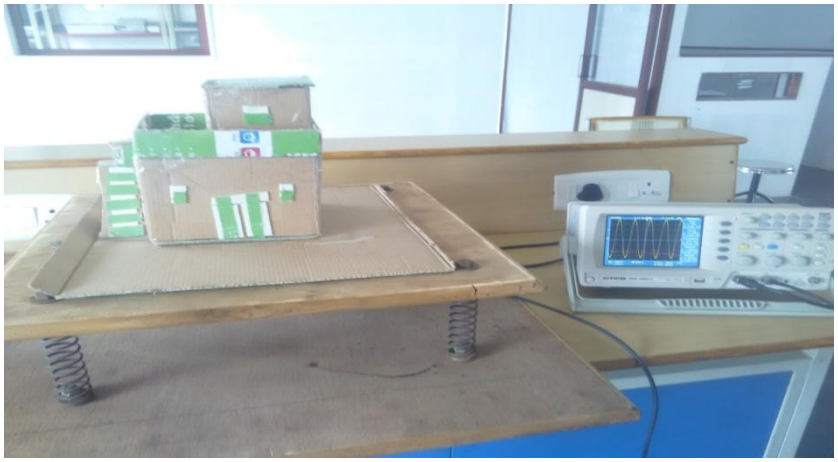

Figure 3 showing results in CRO meter

Table 2 Comparison of parameters of model testing on low frequency shake table

Parameters	LVDT	Acc-2	% diff in Acc-2
Displacement, mm	10.4	9.5	5.62
Natural frequency, Hz	1.45	2.01	3.20

Table 3 Comparison of parameters of model testing on high frequency shake table

Parameters	LVDT	Acc-2	% diff in Acc-2
Displacement, mm	11.1	10.4	3.55
Natural frequency, Hz	1.74	2.01	2.94

IX. LABVIEW PROGRAMMING

By the National Instruments a programming language is done by the method of graphical format is a Lab View. For controlling the instrument setup, it provides the way of graphics and uses C- languages. It uses the C -programming language in a graphic way to control the instrument setup.

X. CONCLUSION

- ✓ The stability of the structure when it is subjected to seismic forces was analyzed with small model shake table.
- ✓ The shake table can run both sine waves and also by wave forms. The accelerometer on the shake table sends a 1 Hz and the sine waves running at 1 Hz again comes back to the original system.
- ✓ The data obtained provides the running capacity.
- ✓ In china and in many other countries the buildings are constructed with application of shake table to protect them from the seismic effects.
- ✓ Our project forces to implement this type of shake table in our country to protect the structures from seismic forces.

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