

FIELD SHAKE TABLE TESTS: AN EFFECTIVE DEMONSTRATIVE TOOL FOR SEISMIC STRENGTHENING BUILDING TECHNOLOGY

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Abstract - It is evident that anywhere in the world, if earthquake of magnitude higher than 5 or more leave behind each earthquake, damaged houses and infrastructures and loss of lives in the affected areas. After each earthquake engineers and researchers also improvise seismic strengthening techniques for affected buildings to make it earthquake safe against future event. Laboratory level experiments may be useful to derive the new and improved techniques to be implemented but in practice at ground level artisans are required to be made not only aware about the same but also needs to be trained to execute in actual practice to make building future earth quake safe.

Field shake table test program in the earth quake affected area can increase awareness amongst the artisans, house owners and can be used effectively for confidence building in the improvisation techniques. Various types of scale modeling of actual houses built by house owners can be tested simultaneously on the same table in the same set of experiment to the level of collapse of non improvised or tradition house, which provide clear understanding to artisans, house owners and viewer. Information dissemination of the seismic strengthening techniques can be made wide spread and quickly among society in general and proactive measures or policy at government level can be made.

Key Words: Shake Table, Seismic strengthening, Improved Houses, Traditional Houses, Information Dissemination, Proactive Measures.

1.INTRODUCTION

If we consider the reaction of the people after every earthquake, there would be no difference in terms of peoples psyche, fear, casual approach related to living once again in the vulnerable houses, non engineered approach towards reconstruction of their houses again but with the use of more expensive materials and without using improvised building elements that can safe guard human life loss against future earth quake. In such circumstances, it is duty of researchers and engineers to build up once again the confidence in the society to reconstruct the houses and infrastructure with the same locally available materials, with the help of same artisans which are available within geographic reach and economically viable way,

but with the use of improvised technology. The demonstration of techniques which were proved effective in the laboratory must have visibility and reach for all and everyone. To serve these purposes "Field shake Table' are supposed to be the most viable means of demonstration for all stake holders ranging from, engineering students, researchers, developers of housing, house owners and artisans community who actually execute.

1.1 The Shake Table

- A Simple Movable 6.5m X 3m RC Platform on Rollers
- Construct one or two Test Models on Platform
- Install acceleration measuring devices
- Apply a series of shocks of increasing intensity and observe impact



Fig-1: Roller Installation and Roller Bearings



Fig-2: Table Frame Erection

1.2 Impact Mechanism or Shock Devices

(a) Tractor with Wooden Ram:

It is essential for shake table installed on a roller bearing with reaction beam at far end that variety of impact mechanism is to be provided. Usually for field shake table programme following two types of mechanism can be installed:



Fig-3: Tractor with wooden ram

when an open field Shake table test program conducted and specifically in rural area, this is most viable option adopted to impart impact on shake table. In the event if the wooden ram get broken into pieces, same can be easily replaced with any kind of jungle wood log of required size.

(b) Pendulum Device:



Fig-4: Pendulum Mechanism

M.S. frame structure with 1.2 Tons or 1.5 Ton loads, a pendulum device can be fabricated near impact end of the R.C.C. shake table. Advantage of the pendulum mechanism is that , " angle of fall" and there by impact load can be controlled and can be decided prior to start the series of tests.

2. The Shake Table testing Program

Series of test program can be designed prior to construct the scaled model on the shake table. Normally two models adjoining to each other can be constructed. Among which one model with improvised techniques which is to be tested and demonstrated is to be constructed near impact end to receives maximum impact energy. At far end or near to reaction end traditional house model is to be constructed so the viewers can relate to that model constructed with their existing house which is collapsed due to earth quake forces in their area of event.

One after another shocks either by tractor attached wooden ram or with the pendulum mechanism is given to shake table and reaction or absorption of energy generated due to impact is to be registered. damage pattern in both the models are to be recorded after each subsequent shocks.

Whenever any model collapse or damage to the level when energy transmission recording is not possible, test must be stopped. The final outcome is recorded and throughout the tests video recording is to be carried out for future dates awareness campaign.

Demonstrative destruction pattern and final collapse of the tradition house verses stable model or very little damaged house model against all impact will create confidence building in the minds of viewers and engineers for the improvisation techniques implementation.



Fig-5: Shake Table Test models



Fig-6: Accelerometer for measuring acceleration



Fig-9: Author is showing the number of shock condition of two models after impact.



Fig-7: Traditional v/s Improved Model on Shake Table



Fig-8: Stable / slightly damaged improvised model v/s total collapsed Traditional Model

3. CONCLUSIONS

After series of shake Table Program, for variety of parameters like, different combination of construction materials like stone, bricks, cement blocks in different binding mortars like cement sand, lime and even mud, each one can be tested to enhance understanding of effectiveness of earthquake resistant features in improvised manner.

A pair of traditional and improvised house model can be studied for the effect of different parameters on structural performance of new techniques. Shake table Test have effective role in building peoples' confidence in quake resistant building technologies. The shock Table Test can be used to Create felt need for long-term safety. While performing the test in the field in presence of hundreds of people, it is actually an attempt to understand the impact of tests on peoples' psyche and also increase the acceptance level of improvised techniques. The results derived from Shake table Test, government agencies can effectively implement statewide campaign of training, awareness and demonstration through videos prepared during on going tests.

It can be concluded that from the field shake table program, a technology in which confidence can be build and felt need for the safe and sound house construction technology can be derived, tested right now, rather than wait for next earthquake.

REFERENCES

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