



MINISTRY OF PUBLIC WORKS AND SETTLEMENT
GENERAL DIRECTORATE OF DISASTER AFFAIRS



EARTHQUAKE ENGINEERING DIVISION AND IMPULSE TABLE TESTS

Earthquake Engineering Division, 2007

OUTLINE

- **General Knowledge about General Directorate of Disaster Affairs and Earthquake Research Center**
- **Studies of Earthquake Engineering Division**
- **Prevalent Construction Process in Turkey**
- **Impulse Table Tests**
- **Conclusion**

Main Responsibilities of GDD

- **Providing emergency aid and securing coordination among the relevant institutions during and after a disaster,**
- **Implementing the measures to provide temporary shelter immediately after the disaster and undertaking the reconstruction and rehabilitation activities of damaged housing, work places and infrastructural facilities,**

Main Responsibilities of GDD

- **Taking measures to realise and coordinate planning, project preparation, implementation, management and control activities in disaster areas as well as in disaster prone areas,**
- **Determining the potential disaster areas and taking the necessary precautions for preventing disasters and minimising the loss of life and property,**

Main Responsibilities of GDD

- **Development of seismological and strong ground motion network for the country, establishment of a national information center of processing of all kinds of earthquake data, such as the preparation of earthquake catalogues and earthquake hazard maps of Turkey,**
- **Establishment of regional centres for the production and storage of prefabricated structural elements aiming at the accommodation of people and coordination of emergency assistance in cases of disasters.**

Main Responsibilities of Earthquake Research Institute

- **Development of seismological and strong ground motion network for the country, establishment of a national information centre of processing of all kinds of earthquake data, such as the preparation of earthquake catalogues and earthquake hazard maps of Turkey,**

Main Responsibilities of Earthquake Research Institute

- **Determination of the criterias which will be used in earthquake resistance structural design**
- **Determination of earthquake behaviour of structures, safety of damaged structures during earthquake, reasons of earthquake damages**
- **Evaluation of repairing and retrofiting methods of damaged structures**

PREVALENT CONSTRUCTION PROCESS IN TURKEY

<http://sindelhoyuk.free.fr>



STUDIES OF EARTHQUAKE ENGINEERING DIVISION

- **The code named “Evaluation and Strengthening of Present Buildings” was performed.**
- **Earthquake code was improved.**
- **Training of civil engineers about the new earthquake code is still continue.**

STUDIES OF EARTHQUAKE ENGINEERING DIVISION

- Starting from 1986 up to now more than 10 varying kinds of masonry buildings were tested on the shaking table.



IMPULSE TABLE TESTS

- **Test houses made from clay brick, lightweight concrete and adobe blocks as well as rubble stone masonry and lightweight prefabricated houses were tested on the table since its construction in 1985.**
- **The test results are most suited for comparing the relative behavior of houses made from different materials.**

IMPULSE TABLE OF THE EARTHQUAKE RESEARCH DEPARTMENT

- **Unidirectional motion**
- **An initial displacement is given to the table and then the table is released**
- **The table vibrates for about 1.5 seconds**
- **It creates inertial forces in the model house on the table**
- **The vibration of the table can be repeated as many times at selected initial displacement as desired**

General View of The Impulse Table

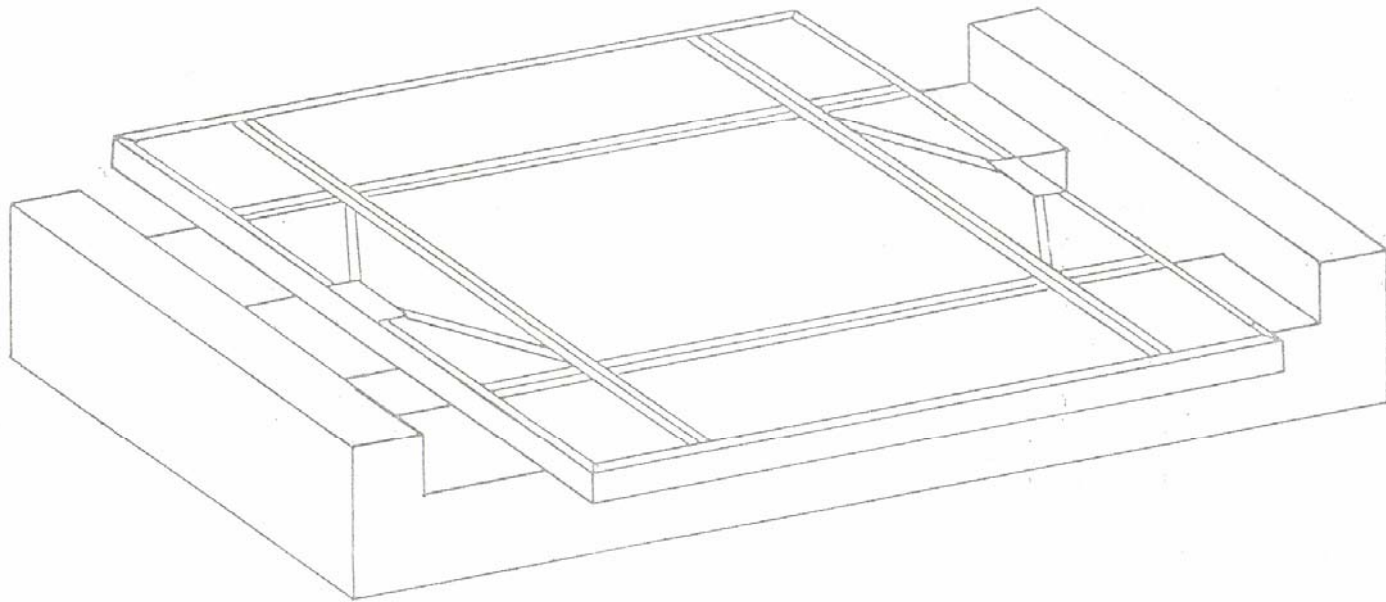
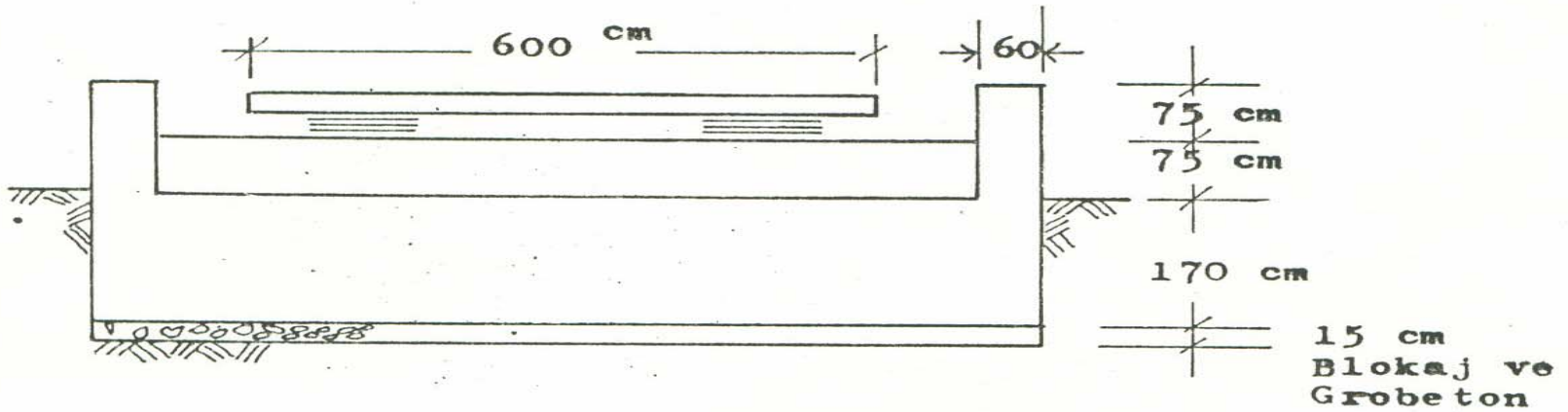
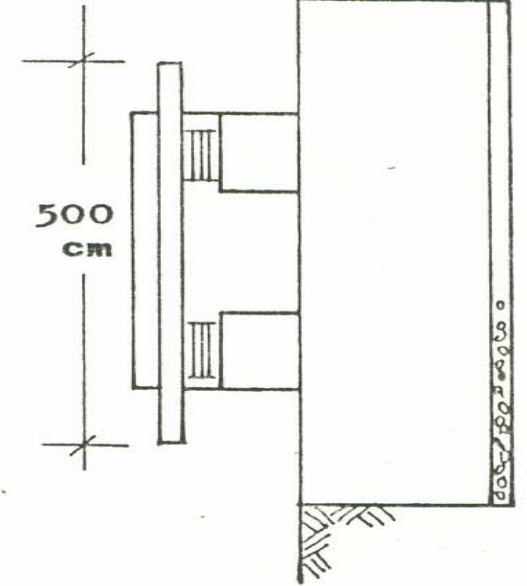
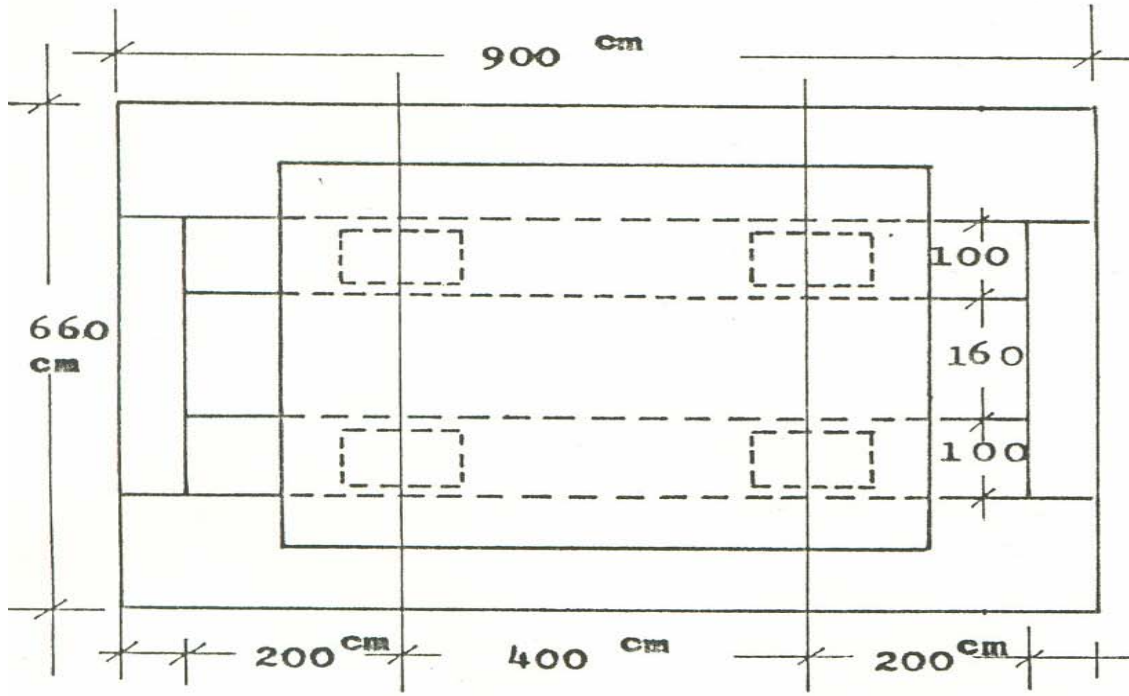


Figure-1 General View of the Impulse Table

Table Characteristics

- Models weighing upto 50 tons can be tested
- Resting on standard machine mountings (Dunlop Metalastik MN 17/242)
- Table Thickness 24 cm, table size 5.0 x 6.0 m , weighs 20.5 tons
- Foundation 9.0 x 6.60 m plan and 1.70 m deep concrete block about 250 tons



Şekil-3 Tablanın Çeşitli Görünüşleri

Table Characteristics

- Steel section U24 and reinforced concrete platform
- Supported at four points with 62 rubber pads in two layers.

RUBBER PADS OF THE IMPULSE TABLE

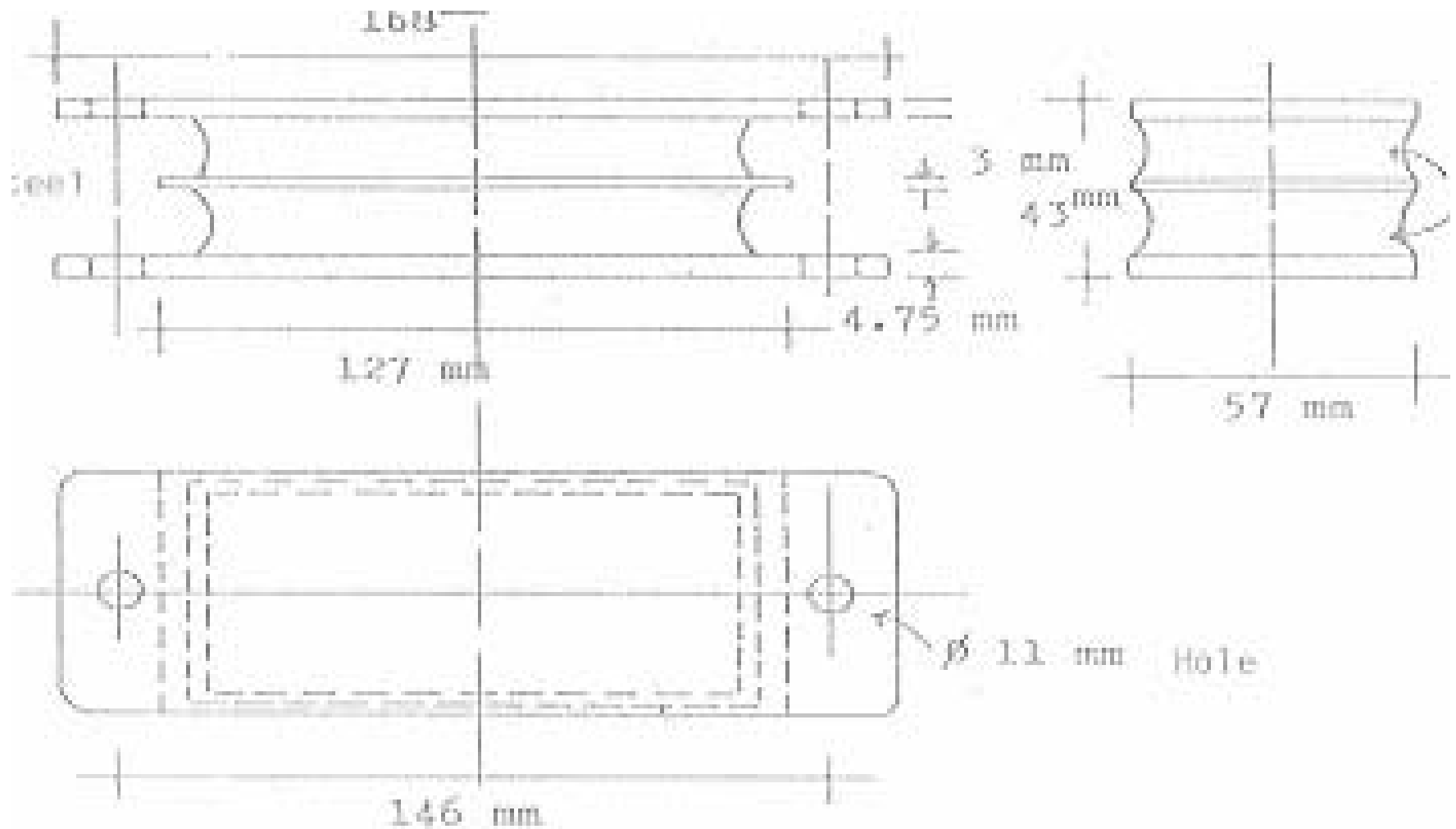


Figure-2 Dimensions of the Rubber Pads

STEEL PLATFORM

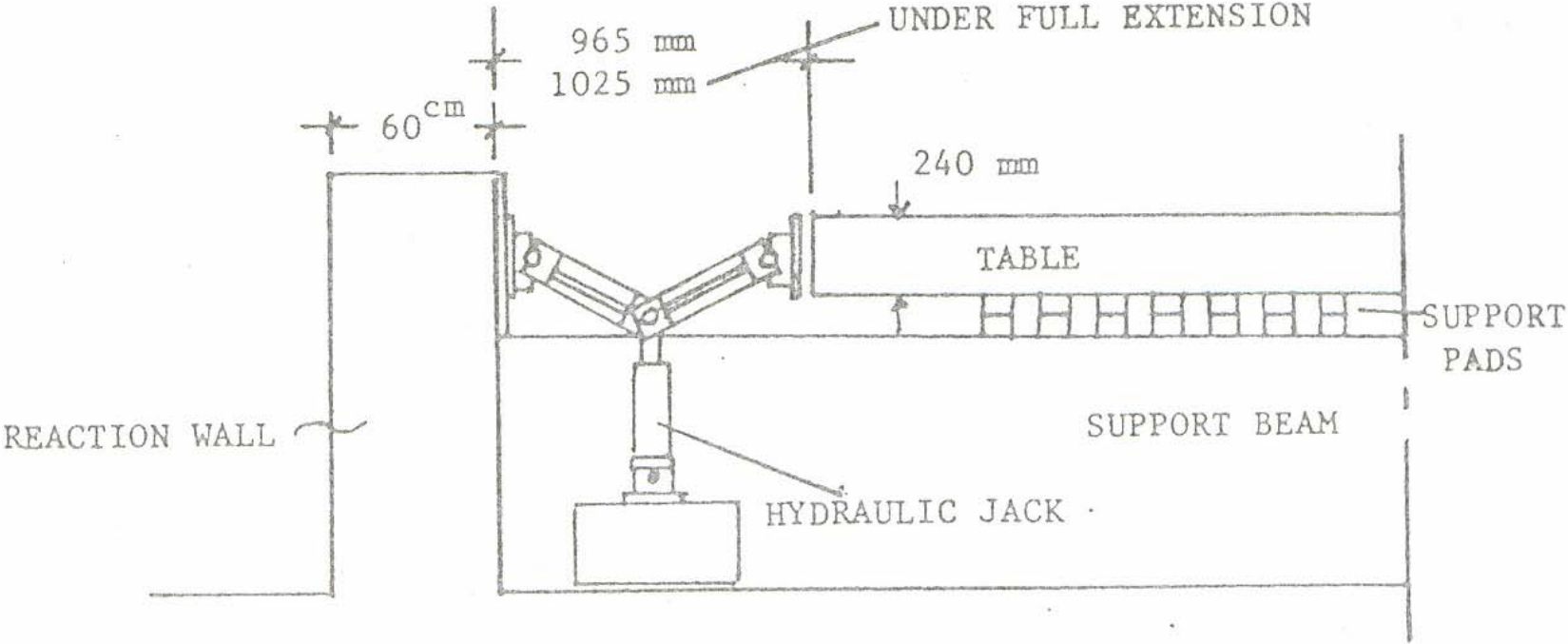


Figure-3 Plan View of the Steel Frame of the Table

Table Characteristics

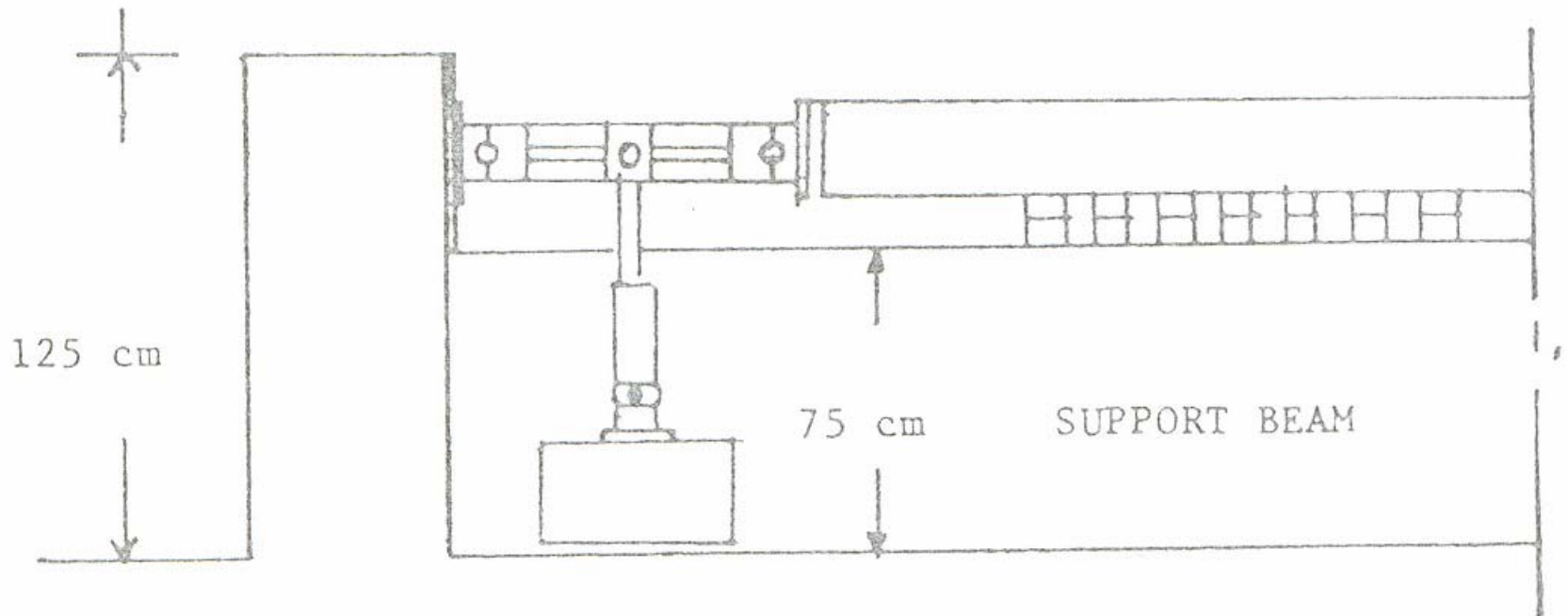
- As the vertical jack pushes the link mechanism upwards the table is displaced horizontally
- When the link mechanism reaches a horizontal position, following a small amount of further push, the link mechanism jumps into the air and the table vibrates freely
- Initial table displacement can vary from 20 to 65 mm
- Table can be pushed from either side.

INITIAL STATE OF PUSH MECHANISM



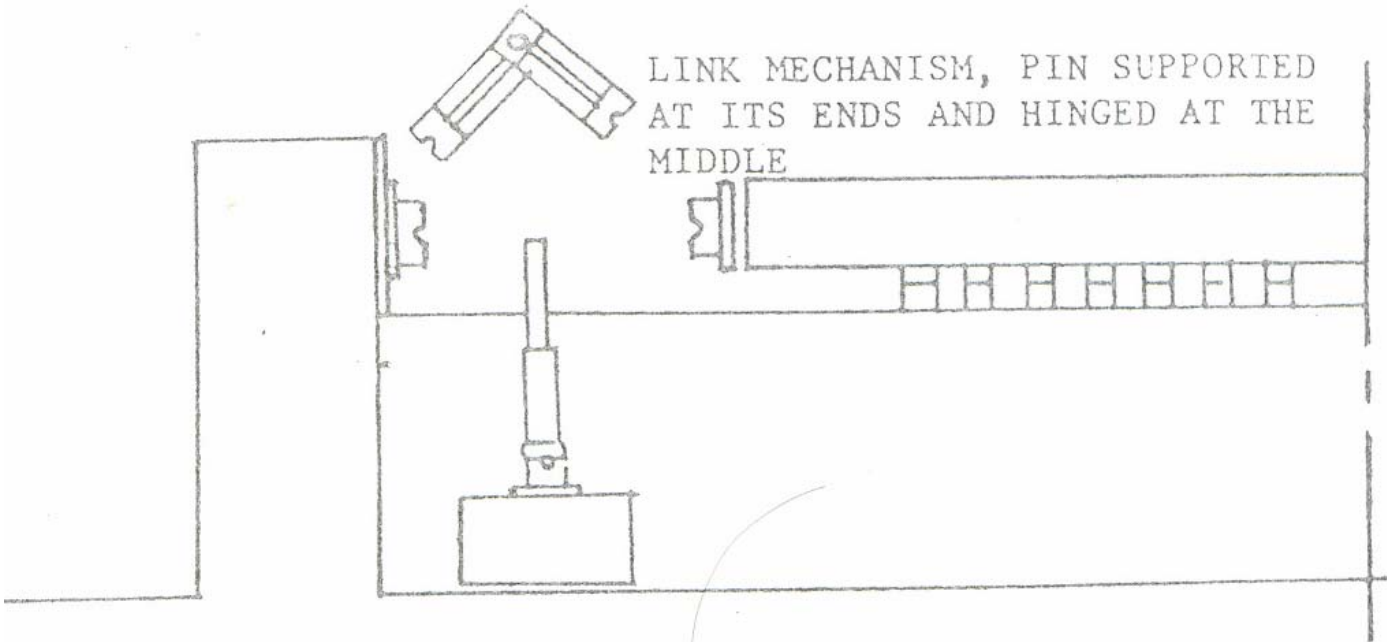
A) At the Start of the Test

UNDER FULL EXTENSION



B) Under Full Extension Just before the Release of the Table

RELEASE OF THE LINK



C) Just at the Moment of Release of the Table. The Link Mechanism Jumps up and Releases the table with initial displacement.

Figure-5. Initial Displacement Mechanism of the Table

TABLE CHARACTERISTICS

- **Max. Displacement capacity of rubber pads 50 mm, at two layers total capacity 100 mm**
- **The distance between table and the reaction wall allows only a maximum initial displacement of 65 mm**

TABLE CHARACTERISTICS

- The table and the model house motion is recorded by accelerographs
- A typical record is as follows
- Since the table displaced only in one direction very small transverse motion occurs
- At large initial displacements pads deform vertically as well, resulting in considerable vertical motion and accelerations and force

TYPICAL SHAKING RECORD

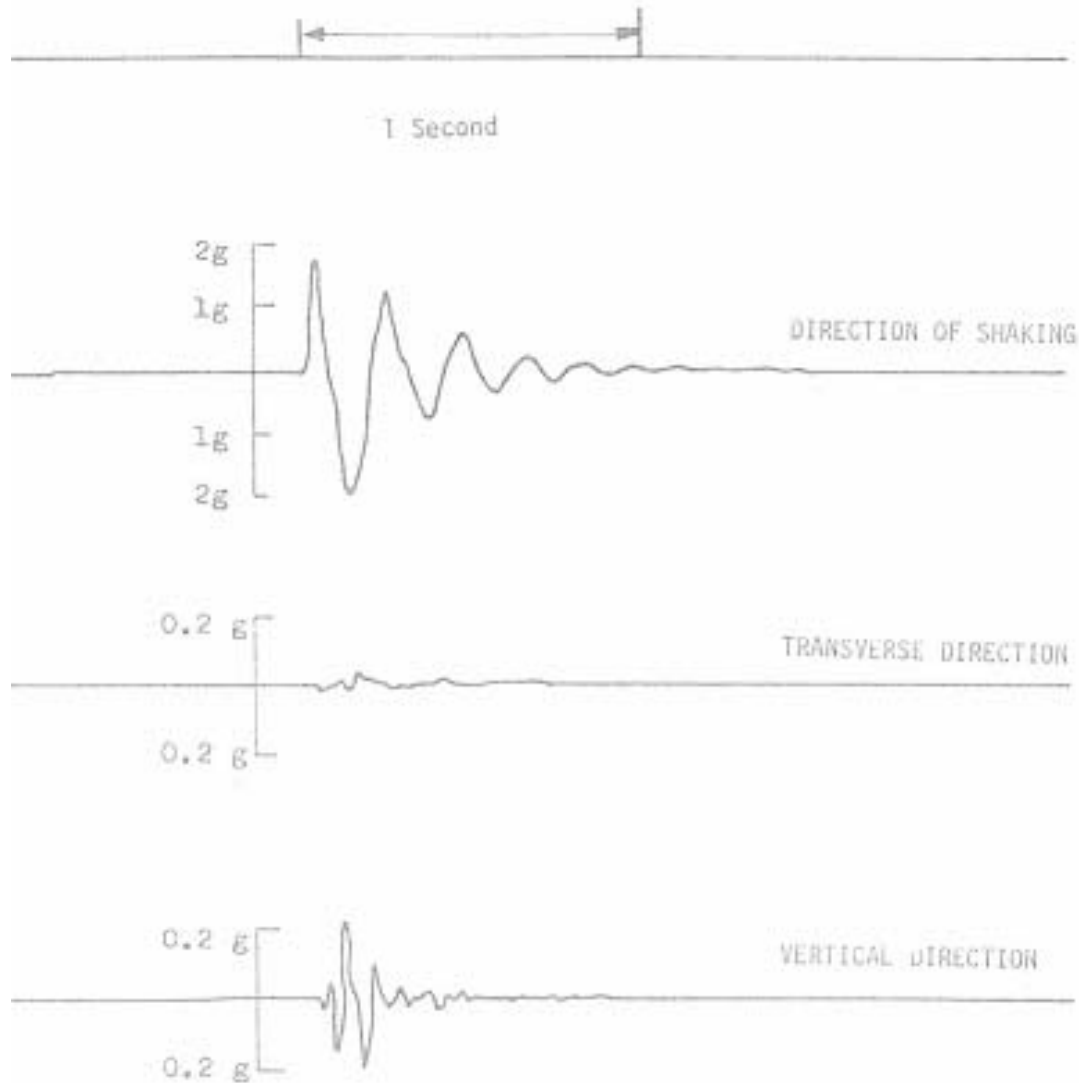


Figure-6 A Record of Table Vibration

CREATION OF VERTICAL ACCELERATION

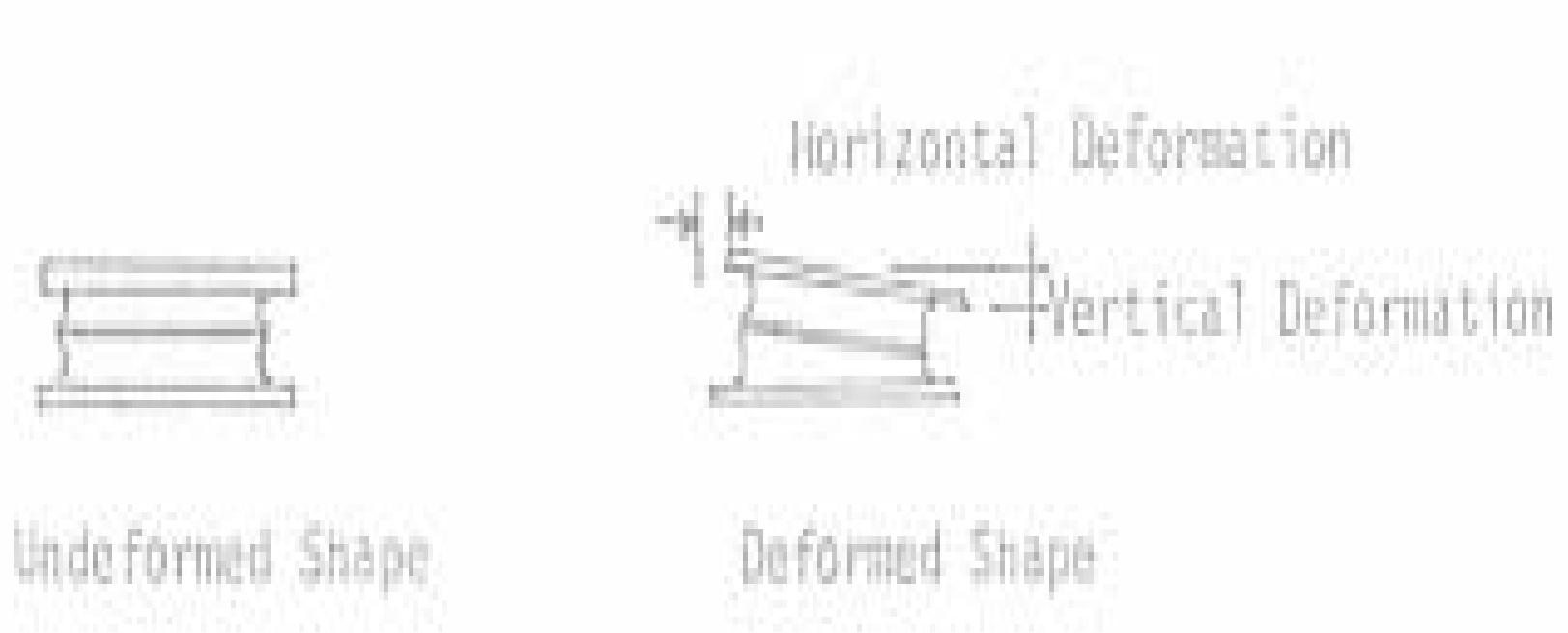


Figure-7 Creation of Vertical Deformation

Impulse Table Experiment of a Rehabilitated Brick Masonry Building

- During the experiments, buildings resisted to the horizontal forces which are 2 - 2.2 times greater than the building's weight. Furthermore by this rehabilitation improvement of the crack is prevented.



CONCLUSION

- **Several kinds of masonry buildings were tested by Earthquake Engineering Division.**
- **Our division can take part in Component 2-1: Research with full scale shaking table experiments**