INVESTIGATION OF LATERAL RESISTANCE OF MASONRY AND ADOBE STRUCTURES BY MEANS OF A TILTING TABLE

by

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SYNOPSIS

Construction of shaking table facilities for earthquake testing in most seismic developing countries is unfeasible due to high initial costs and the intensive need for skilled technicians for their maintenance and operations. In these countries a pressing need exists to develop a simpler laboratory tool for the study of the lateral strength of low-cost buildings especially those of low-rise masonry and adobe type. To satisfy this need an experimental tilting table is being developed by the author in Shiraz, Iran. In this method of testing the model buildings will be secured on the table deck. By tilting the deck of this table a lateral static force will be induced in the test model. Using the laws of static from the angle of the slope this force can be easily computed and related to the cracks or damages observed on the test model.

DESCRIPTION OF THE TESTING SYSTEM

Fig. 1 shows the general arrangement of the table. The 4mx4m R.C. Deck of the table is supported on a horizontal pivot. One side of the table can be raised or lowered by a hoist, causing the table deck to rotate up to 40° in each direction around the pivot. Each test model will be constructed on a moving slab. This slab can be moved on guideways and can be positioned and secured on the table deck. During the test the slope of the table deck is increased in increments. The structural behavior of the test model and crack formations will be recorded for each tilt angle. This procedure is continued until model fails. Auxiliary facilities such as four 4mx4m R.C. moving slabs and a 14m long guide-way with roller-bearings and a moving frame will be constructed so that the tilting table will not remain idle during the lengthy period of construction and curing of test models. Tilting table can be used for: 1) comparative study of the lateral strength of building models having different types of mortars, architectural forms, etc., 2) obtaining the weak points and the failure modes, and 3) evaluating the effectiveness of various systems proposed for increasing the lateral strength of the buildings. Earthquakes produce a uniform distribution of lateral acceleration in most short period rigid buildings. Therefore, in many seismic design codes, for one to three story rigid buildings, the distribution of earthquake design acceleration is assumed to be uniform. In addition the resulting earthquake design lateral loads are considered to act as static loads. This type of distribution of lateral loads is similar to those generated in the test models on the sloped deck of a tilting table. Thus by this method of testing the lateral strength and the margin of safety of short-period buildings in terms of the code loads can be readily determined. Testing with a tilting table in some cases may be easier and more realistic than push or pull tests using tractors, hydraulic jacks or vibrators. The effect of stress reversal and of increase in axial loads can be easily included in this testing system, by reversing the slope of the table and by precompression of walls using special hold down ties respectively.

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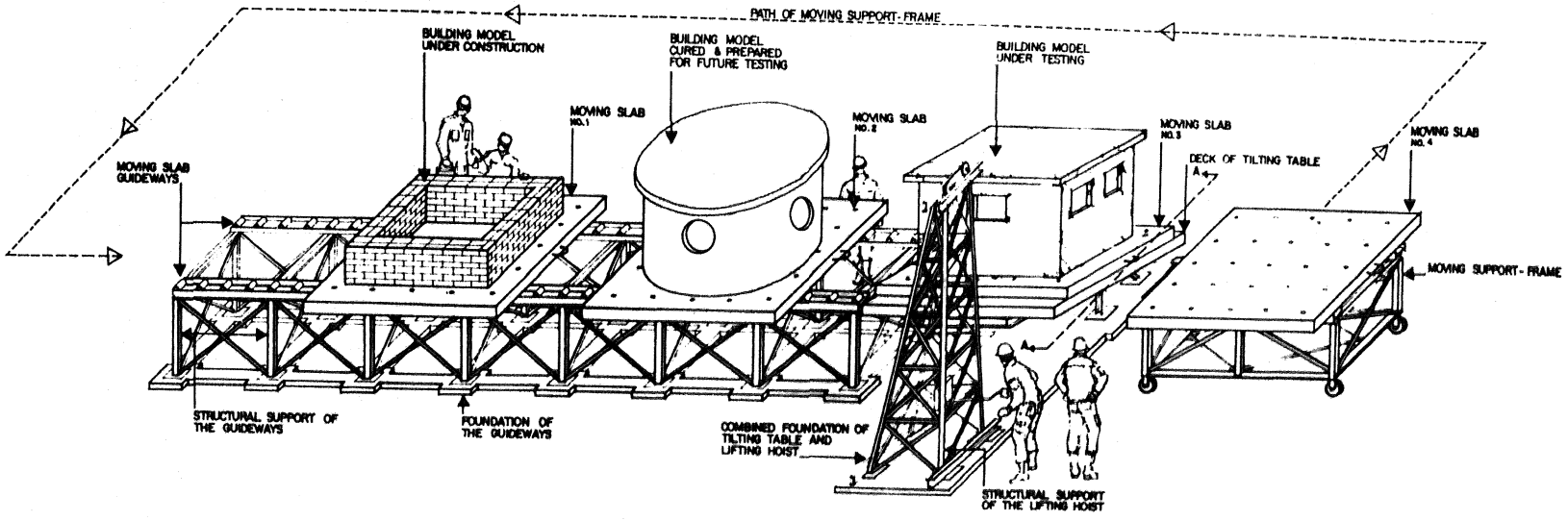
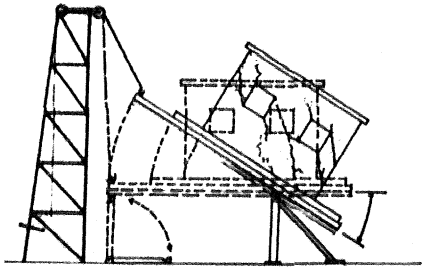


FIGURE. 1. GENERAL ARRANGEMENT OF THE TILTING TABLE TESTING SYSTEM USED FOR DETERMINATION OF LATERAL LOAD RESISTANCE OF LOW-RISE BUILDINGS



ELEVATION A-A