DYNAMIC TEST OF A 1/8 SCALE TWO STORY LIGHTLY REINFORCED CONCRETE BUILDING

By

Khaled Sherif Abd-Elrahman Mohamed

B.Sc. Structural Engineering,
Helwan University, 2007.

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE
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STRUCTURAL ENGINEERING

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Title of Thesis: **DYNAMIC TEST OF A 1/8 SCALE TWO STORY LIGHTLY REINFORCED CONCRETE BUILDING**

Key Words: Shaking Table - Microconcrete – Heat treatment – Dynamic model

Summary:

A 1/8 scale reinforced concrete building model was tested on a shaking table. The reinforcement details were based on typical elements subjected to vertical loads only according to (ECP 203). The model was tested using the time compressed Aqaba 1995 earthquake at different amplitudes. Free vibration test were performed before and after each seismic test to study the changes in the model building properties. Test results indicated that the non seismic reinforcement details may form a potential source of damage, and it was found experimentally that they did not lead to collapse or a complete failure mechanism.

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ABSTRACT

A 1/8 scale two story one bay by one bay lightly reinforced concrete building was tested on the Cairo University shaking table. The structure model was designed solely for gravity loads without regard to any kind of lateral loads (wind or earthquakes), and had no walls or partitions. The reinforcement details were based on typical reinforced concrete elements subjected to vertical loads only according to (ECP 203), and characterized by (a) low reinforcing ratios in columns, (b) discontinues positive moment beam reinforcement at the columns, (c) low joint confinement, and (d) lap splices located immediately above the floor level. The model was tested using the time compressed Aqaba 1995 earthquake at different amplitudes. Free vibration test were performed before and after each seismic test to study the changes in the model building properties.

Test results indicated that this type of reinforced concrete frame will experience very large deformations associated with considerable stiffness degradation during a moderate earthquake. Although the non seismic reinforcement details may form a potential source of damage for lightly reinforced concrete building, it was found experimentally that they did not lead to collapse or a complete failure mechanism. The model failures occurred outside the joint region, indicating that the lack of joint confinement was not a potential source of damage. Also, the location and details of the column lap splices did not cause a serious problem to the model.

Both experimental and analytical results indicated that the inclusion of the slab contribution to the beam flexural strength is a vital step in the assessment of the performance of lightly reinforced concrete structures during earthquakes since it has the potential of altering the relatively ductile strong column weak beam mechanism to the more brittle soft story mechanism.

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