شبكة المعلومات الجامعية

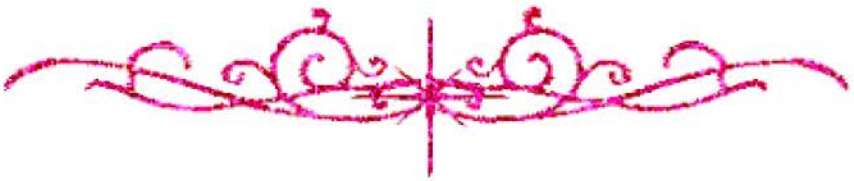
بسم الله الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم



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شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

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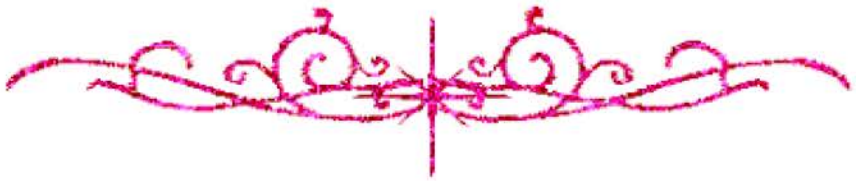
بعض الوثائق الأصلية تالفة



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شبكة المعلومات الجامعية

بالرسالة صفحات

لم ترد بالأصل

HOSSAM MAGHRABY

SEISMIC UPGRADING OF GRAVITY LOAD DESIGNED CONCRETE BUILDINGS USING ADVANCED COMPOSITE MATERIALS

By

BADR MOHAMED KAMEL ABOU-ZEID

B.Sc. Civil Engineering 2000
Cairo University

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

MASTER OF SCIENCE
In
STRUCTURAL ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the supervision of

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Prof. Dr. MEDHAT AHMED HAROUN, Member

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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2004

بسم الله الرحمن الرحيم

وعلمك مالم تكن تعلم وكان فضل الله عليك عظيما

صدق الله العظيم

(النساء 113)

ABSTRACT

Many of the existing reinforced concrete structures performed poorly during recent earthquakes as they were designed to resist gravity loads only with inadequate seismic detailing. Several of the construction details in existing gravity-load buildings do not conform to current code requirements for seismic design and may lead to nonductile behavior. The objective of this research is to investigate the use of advanced composite materials for the rehabilitation of nonductile R.C. buildings. The study is limited to low-to-medium-rise frame buildings. Four reinforced concrete buildings, three, six, nine and twelve stories, were selected to represent existing nonductile structures that were designed according to early codes. The seismic response of the buildings was evaluated in terms of deformations and damage. The buildings were considered as a series of planer frames connected at each floor by a rigid diaphragm, therefore, only 2D analysis was performed.

The buildings seismic performance parameters were obtained using nine ground motion records with different characteristics. The selected records covered a wide range of frequency content and strong ground motion durations. The free-vibration characteristics of the buildings were determined and the relation between the building seismic performance parameters and the PGA level of the earthquake records was investigated. The relation between the deformation and damage for the four buildings was evaluated. The response of the same reinforced concrete buildings wrapped with advanced composite materials under seismic loads was evaluated. An enhanced hysteretic model was implemented to represent the inelastic behavior of wrapped columns. In order to examine the inelastic cyclic behavior of the wrapped columns a quasi-static displacement analysis was performed to simulate the results of specimens from several experimental programs. Several iterations were performed to adopt the hysteretic parameters that correctly simulate the experimental hysteresis loops.

The analyses showed that the seismic responses of the reinforced concrete frames rehabilitated with advanced composite materials were better than that of the original frames in terms of drift, ductility demand and failure mode. Using externally bonded FRP to strengthen the columns resulted in an improvement in the seismic response as follows:

- Roof drift ratio was reduced 10% to 20%.
- Maximum inter-story drift ratio was reduced 10% to 27%.
- Damage index, Dg, was reduced 28% to 32%.