شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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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

HANAA ALY

PERFORMANCE-BASED PLASTIC SEISMIC DESIGN OF RC STRUCTURES CONSIDERING SOIL-STRUCTURE-INTERACTION

By

Mohamed Kamal-Eldin Mahmoud Hassan Elkazak

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
Structural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:
PERFORMANCE-BASED PLASTIC SEISMIC DESIGN OF RC STRUCTURES CONSIDERING SOIL-STRUCTURE-INTERACTION

Key Words:
Performance-Based Plastic Design (PBPD); Reinforced Concrete Special Moment Frames (RC SMF); Soil-Structure Interaction (SSI); Pushover Analysis; Fragility Curve.

Summary:
Performance-Based Plastic Design (PBPD) method is widely extended for seismic design of building structures. A pre-selected target drift and yield mechanisms are used as key performance objectives. In this research, reinforced concrete special moment frames (RC SMF) were used in four architypes concrete structures designed according to both ACI-318/ASCE-07 and PBPD. RC SMF was also combined with a homogeneous soil half-space to provide a simplified Soil-Structure-Interaction (SSI) model. Six types of clay and sandy soils were considered in this study. In addition to considering pile caps and piles foundation system to provide a soil-pile-structure-Interaction (SPSI) model. Nonlinear lateral load-transfer from the foundation to the soil is modeled using p-y curves for soft clay soil that was considered in this study. Numerical results obtained using soil-structure-interaction model conditions were compared to those corresponding to fixed-base support conditions, such as fundamental time period, structural capacity, storey displacement and storey drift. On the other hand, incremental dynamic analysis (IDA) in addition to pushover analysis were conducted under a set of ground motion records, and scaling peak ground acceleration to an increasing design acceleration. Five levels of performance based seismic designs, namely: operational phase (OP), immediate occupancy (IO), damage control (DC), life safety (LS), and collapse prevention (CP), were considered to assess structural performance. Numerical results obtained for fixed-base support conditions, and fragility curves for several performance limits were generated for both types of models.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Mohamed Kamal-Eldin Mahmoud Date: …/.../2021

Signature:

Dedication

To My Parents, Sister and Brother,
For their support and their faith.

To My Wife,
For her encouragement and her patience.

To My Daughter ALYA
The joy of my life.

Acknowledgment

First of all, I would like to thank God for making everything possible by giving me strength to complete this work.

I owe my deepest gratitude to Professor Dr. Mohamed Abdel-mooty, for his encouragement, guidance and patience during my study.

My sincere thanks also go to my research supervisor Professor Dr. Adel Akl, for his support and guidance during my study.

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