PROPOSED METHOD FOR THE SEISMIC ANALYSIS AND DESIGN OF CONCRETE BARRAGES IN EGYPT

By

Amr Abdelbaset Hamed Mahmoud

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
GIZA, EGYPT
2018

PROPOSED METHOD FOR THE SEISMIC ANALYSIS AND DESIGN OF CONCRETE BARRAGES IN EGYPT

By

Amr Abdelbaset Hamed Mahmoud

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

Under the Supervision of

Prof. Dr. Mohamed Sobaih	**Prof. Dr. Yasser El-Hakem**
………………………………..	……………………………..
Professor of Structures Structural Engineering Department Faculty of Engineering, Cairo University	Professor, and Deputy Director Construction Research Institute National Water Research Center

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2018

PROPOSED METHOD FOR THE SEISMIC ANALYSIS AND DESIGN OF CONCRETE BARRAGES IN EGYPT

By
Amr Abdelbaset Hamed Mahmoud

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

Approved by the
Examining Committee

____
Prof. Dr. Mohamed Sobaih, Thesis Main Advisor

____
Prof. Dr. Yasser El-Hakem, Advisor

____
Prof. Dr. Adel Yehia Akl, Internal Examiner

____
Prof. Dr. Ahmed Shawky Hashad, External Examiner

- Construction Research Institute, National Water Research Center

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2018

Engineer's Name: Amr Abdelbaset Hamed Mahmoud
Date of Birth: 25/07/1992
Nationality: Egyptian
E-mail: Amr.abdelbaset2014@gmail.com
Phone: 01227058434
Address: Egypt-Cairo

Registration Date: 01/03/2015.
Awarding Date: …./…./2018.
Degree: Master of Science
Department: Structural Engineering Department

Supervisors:

Prof. Dr. Mohamed Sobaih (Thesis main advisor)
Prof. Dr. Yasser El-Hakem (Advisor)

Examiners:

Prof. Dr. Ahmed Shawky Hashad (External examiner)
Construction Research Institute, National Water Research Center
Prof. Dr. Adel Yehia Akl (Internal examiner)
Prof. Dr. Mohamed Sobaih (Thesis main advisor)
Prof. Dr. Yasser El-Hakem (Advisor)

Title of Thesis: **Proposed Method for the Seismic Analysis and Design of Concrete Barrages in Egypt**

Key Words:
Seismic analysis; Seismic design; barrages; response modification factor; modal pushover analysis

Summary:
There is a lack of codes and regulations for seismic design of hydraulic structures such as barrages in Egypt, and also there is no classification of these structures according to their importance. These lead to variation of the design method and evaluation of these structures in Egypt. The main objective of this study is to develop regulations for determining the peak ground acceleration (PGA) considering the life span and the importance of these facilities. A classification for concrete barrages according to their importance was suggested. Suggested methodology for the seismic design of these facilities in Egypt was developed to ensure rules for the design and evaluation stages. Comparison between the proposed method and the existing methods given in seismic codes of practice was performed. Nonlinear static analysis (Pushover analysis) and time history analysis were utilized in this study to determine the design seismic force using a suitable ground motion records. Another objective of this research is to conduct a numerical study to evaluate the effect of variation of geometric configurations of barrages on response modification factor (R).

Acknowledgments

I would like to express my sincere appreciation to everyone who has contributed towards the successful completion of this thesis. My supervisor **Prof. Dr. Mohamed Sobaih**, Professor of Structures, Faculty of Engineering, Cairo University, for his valuable suggestions, guidance and the time spent in refining the manuscripts and discussing the subject with me.

I would like to express my thanks and gratitude to **Prof. Dr. Yasser El-Hakem,** Professor, and Deputy Director, Construction Research Institute, National Water Research Center, for the references he provided me and the time spent in refining the manuscripts and discussing the subject with me.

Dedication

To my parents; my sisters and

my friends (Mohamed and Aziz).

Table of Contents

List of Tables

List of Figures