Ain Shams University
Faculty of Engineering
Structural Engineering Department

Analysis of Interaction of In-Situ Walls with Ground

By

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A Thesis

Submitted in Partial Fulfillment for the Requirements of the Degree of Master of Science in Civil Engineering

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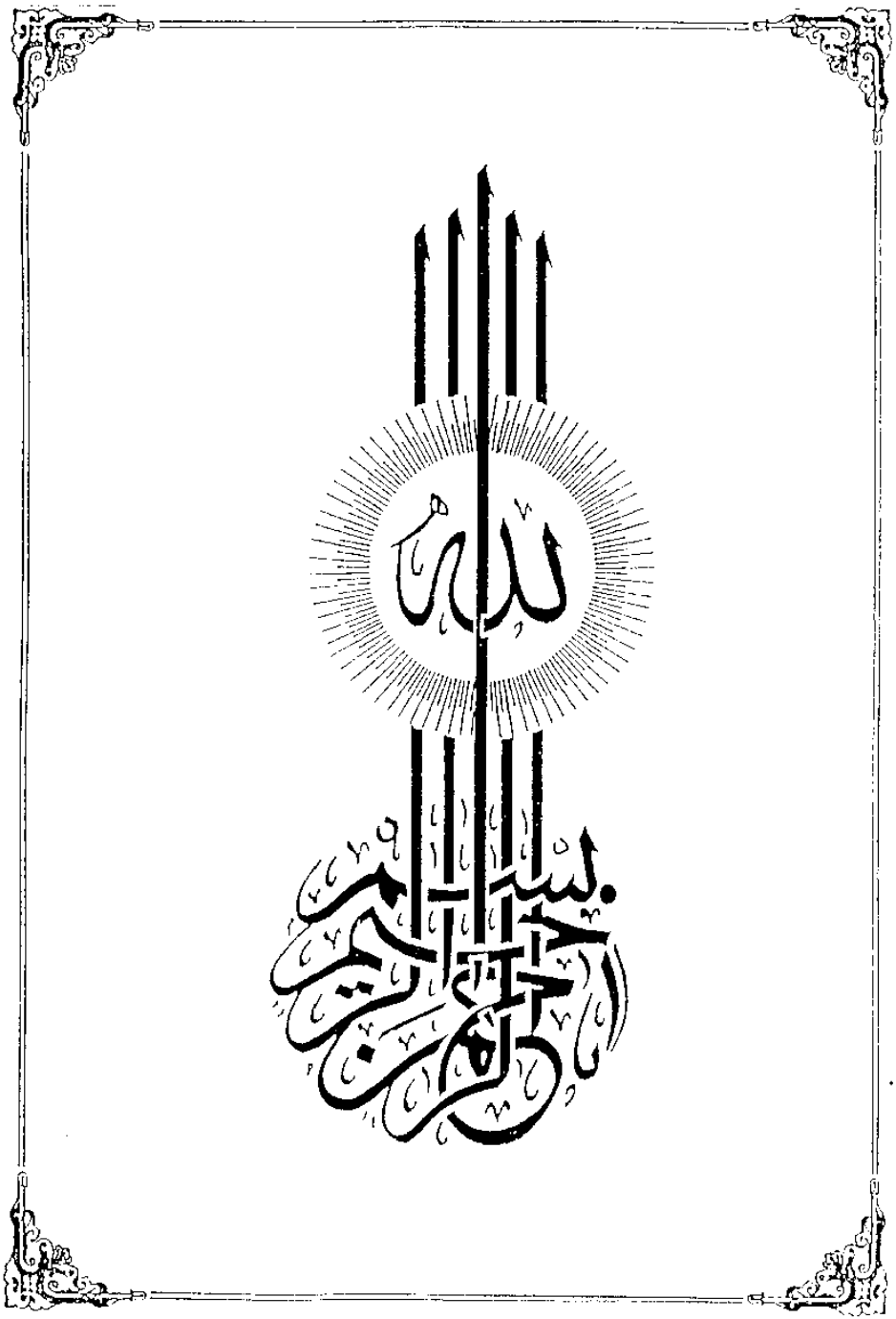

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STATEMENT

This dissertation is submitted to Ain Shams University for the degree of M. Sc. in Civil Engineering.

The work included in the thesis was carried out by the author in the department of Structural Engineering, Ain Shams University, from April, 1996 to July 1997.

No part of this thesis has been submitted for a degree or a qualification at any other university or institution.

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Abstract of the M. Sc. thesis submitted by:

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Abstract

Braced excavation construction is an important and commonly encountered geotechnical problem in urban development. It is usually analyzed using conventional design methods or linear elastic finite element analysis without sufficient consideration of the modeling of the construction operations and soil-structure interaction effects.

This research proposes a software computer program for designing the braced excavations to be constructed in soils. The program uses recent design practices to achieve improved speed as well as reliability of calculations.

The program is coded with a high degree of user friendliness through an easily followed format and explicit data prompts. Primary emphasis in developing the software is placed on assessment of the effect of complex as well as nonuniform soil conditions in order to achieve the safest and most economical design of braced excavations. Finite elements were used in the program, and the nonlinear stress-strain behaviour of the soil was utilized. Spring type (lateral subgrade reaction) interface elements were adopted to model the soil-diaphragm wall contact surface.

This thesis presents a comparative study between result of the nonlinear finite element analysis and the field measurements which had been compiled during construction of one of the subway stations of the Greater Cairo Underground Metro, line 2.

An extensive paramtric study was also carried out to evaluate the sensitivity of the utilized numerical model and the effect of the different factors concerning the soil-wall interaction on the behaviour of the diaphragm wall.

Key words: Braced excavation, computer program, comparative study, diaphragm wall, lateral subgrade reaction, spring, nonlinear analysis, Finite element.

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