



DESIGN OF SOIL STEEL COMPOSITE BRIDGES (SSCBS) AND ANALYSIS OF ASSOCIATED ARCHING ACTIONS

By

Islam Mamdouh Ezz El-dein

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
CIVIL ENGINEERING – PUBLIC WORKS

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
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Key Words:

Flexible culvert; straining actions; arching effect; Pneusol; finite element modeling.

Summary:

This research mainly aims to study the shallow tunnels called “Soil Steel Composite Bridge (SSCB)” using flexible corrugated steel sheets. The SSCB has become a promising technique with economic benefits compared to other alternatives using different methods or materials. The analysis depends on the Skivarpsån SSCB in Sweden as a case study with field measurements of the vertical deflection and the straining actions. A numerical model of the case study is performed using the finite element program PLAXIS 2D to simulate the interaction between the tunnel and the surrounding backfill soil. The Swedish Design Method (SDM) is an empirical solution used to design the SSCBs with flexible metal cover. The results of the numerical model are compared with the field measurements and the SDM predictions to get the most accurate simulation to the field test. Embedding Pneusol material is a new technique used to reduce the developed straining actions in the SSCBs.

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:

date:

Signature:

Dedication

My dedication is to my dearest father (Eng. Mamdouh Ezz), my kindest mother, Sara my beautiful sister and Yomna my precious fiancée. They always support me in all aspects of my life. Therefore, I hope to make them always proud of me and make their dreams of me come true one day.

Eng. Islam Mamdouh Ezz

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