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
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GIZA, EGYPT
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Title of Thesis:

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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

Acknowledgments

First at all, I thank ALLAH for all his blessings and giving me the ability and patience to reach what I am now.

I would like to express my gratefulness to prof. Dr. Mohamed El-kholy for his supervision, support, and guidance. His experience and knowledge always encourage me to work in a motivated environment and do my best in this research properly.

I would like to thank Dr. Sherif Akl for being my mentor and supervisor. His honest encouragement and support are the main reasons to accomplish my thesis. In addition, he is not only my supervisor as i consider him as a big brother for me. I learnt from him a lot not only on the scientific level but also the personal one. Hope to see him a great professor soon with successful career.

In addition, my grateful thanks to my professors from the Soil Mechanics Research Laboratory at Cairo University for their honest support: Prof. Abd El-Salam Salem, Prof. Hussein El Mamlouk, Prof. Mohamed Amer, Prof. Mostafa Abu Keifa, Prof. Ahmed Hisham, Prof. Hani Lotfy, Prof. Ashraf Kamal, Prof. Yasser Hegazi, Prof. Rami El Sherbiny, Dr. Omar Ezz El-dein, Dr. Mohamed Yehia, Dr. Manal Salem, Dr. Asmaa Moddather, Dr. Amr El Hakim and Dr. Shehab Wessa.

I would like also to thank my colleagues and brothers from the Soil Mechanics Research Laboratory: Eng. Mohamed Salah, Mohamed Kamal, Ahmed Abd El-Aziz, Ahmed Omar and Ahmed Saad for being helpful and supportive too. Hope them the best always in their career and life.

Finally, my deep thanks to all my friends and brothers who always being there for me: Tarek Mostafa, Islam Essam, Ahmed Yasser, Mohamed Raaft, Aswany, Ahmed Gomaa, Abd El-Moneam Mahmoud, Abd El-Rahman Naser, Abd El- Rahman Mohamed, Beshoy Samy, Ahmed Ragab, Ahmed Kamel, Mohamed Abo Bakr, Adnan Nada, Kamal, Zizo, Kareem Mousa, Hayel El-Naggar, Esraa Samir, Menna Allah Ayman, Asmaa Salah, Shimaa Maher, Yasmine Magdy and Aya Mostafa. Hope to see you all always happy and successful.

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