

**DETERMINATION OF LATERAL BEHAVIOUR OF
TALL BUILDINGS WITH SUB AND SUPER
STRUCTURE MODELLED WITH SOIL**

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Thesis submitted to the in partial fulfillment of the requirements for the Degree of Master of
Engineering in Structural Engineering Design.

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Sri Lanka.

November 2009

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ABSTRACT

In current methods of analysis and design of tall buildings of 40 to 50 storey's for lateral loads are modeled only to act on the superstructure. However most of the high rise buildings in Sri Lanka are on pile foundations and most probably with one or more basements. The lateral behavior of high rise buildings with substructure is observed in this research to a certain extent. Only wind load is considered as the lateral load of this study. It is identified that the substructure-superstructure modeling is practical

The substructure piles are modeled with soil springs to accommodate the horizontal soil resistance and available methods to calculate the modulus of sub grade reaction and the spring constant are discussed. Piles are modeled as frame elements and pile caps are modeled as shell elements. When the modeling of pile caps, tie beams are introduced to enhance the integrity and lateral stiffness. Basement walls are modeled as shell elements and the soil springs are introduced to give the effect of soil. SAP 2000 software package was used as modeling tool of the case studies.

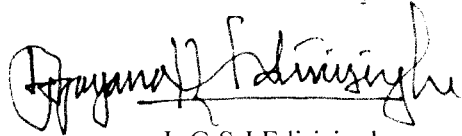
A 40 storey building is analyzed for different lateral load combinations; without basements and without piles, with basement and without piles, without basement and with piles and with basement and with piles. The same scenario is carried out for a 50 storey building.

Mainly the drift due to lateral loads and axial shortening are observed and analyzed. The buildings modeled with piles give the highest drift and highest axial shortening for both buildings. When there is a basement, additional lateral load resistance is observed.

It is important to find out the drift or sway of the building modeled with piles when the building is not having basement to transfer lateral loads to the soil. The drift and the axial shortening can be properly identified when the building is modeled with substructure-superstructure together. The base shear of similar order of magnitude is observed in the buildings modeled in superstructure only and in buildings with substructure-superstructure together.

DECLARATION

I declare that this thesis is the result of my own investigation and that it has not been submitted in candidature for a degree/diploma of this or any other university.


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ACKNOWLEDGEMENT

My sincere thanks to the project supervisor Prof. M. T. R. Jayasinghe, for devoting his valuable time in guiding me to complete the research study. It is no doubt that without his interest and guidance this would not have been a success. He not only provided direction and guidance through the course of this research, but also inspired me to really learn and understand structural engineering.

I wish to thank the Vice Chancellor, Dean of the Faculty of Engineering and Head of the Department of Civil Engineering of the University of Moratuwa, for the permission granted for this research work. Further, I wish to offer my thanks to the Co-ordinator of the Post Graduate research work of Structural Engineering and all the lecturers and staff of the Department of Civil Engineering who helped me in numerous ways. Also I wish to thank the librarian and the staff of the library for the co-operation extended to me for this research work.

I am particularly indebted to Eng S A Karunaratne, Managing Director, Eng R M A Senarath, Director, and Eng D G R Jayasinghe, Engineer Projects of STEMS Consultants (Pte) Ltd, for the financial assistance and encouragement given me to follow the this postgraduate degree course. I like to express my gratitude to Archt(Miss) Madhu Moonesinghe, Eng(Miss) Sadhana Kurumbalapitiya and Eng Uditha Dissanayake who helped me to success this thesis in numerous ways , to prepare this thesis.

I would like to dedicate this hard work to my parents, my brother and two sisters for their enormous support and encouragement. There are many who helped me to succeed in education from my childhood to date. I regret for my inability to thank them individually, but I offer my heartiest thanks to all of them.

L G S J Edirisinghe
STEMS Consultants (Pte) Ltd
December 2009

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