

**FEASIBILITY OF USING LIGHTWEIGHT LOAD-
BEARING PANEL SYSTEMS IN DUPLEX
APARTMENTS OF TALL BUILDINGS**

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Degree of Master of Science

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University of Moratuwa

Sri Lanka

August 2023

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Thesis submitted in partial fulfilment of the requirements for the degree Master of
Science in Civil Engineering

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DECLARATION

I declare that this is my own work, and this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma at any other university or institute of higher learning, and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Master's thesis under my supervision.

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Date: .25.08.2023.....

ABSTRACT

As an inevitable result of the growing population in recent times, requirements for housing facilities, land scarcity, and overexploitation of natural resources have created many problems, both environmental and social. Due to the shortage of land in cities, land prices have increased rapidly in recent times. One solution for the lack of land is to have multi-storey apartment buildings, though the land prices can be distributed among many owners. Because of that, over the last few decades, the number of tall buildings has seen an exponential increase. Moreover, because of the urbanization of cities, more people tend to live in apartment buildings than in small housing units. Along with that, the time taken for the construction and the cost can be identified as significant issues in construction. To overcome these problems, lightweight EPS panels can be considered a proper alternative.

This research is mainly focused on assessing the structural feasibility of a duplex apartment with tall buildings. This can have a significant cost benefit since the strong post-tensioned concrete floor is needed only once on two floors. To achieve that, load-bearing partitions should be lightweight. The lightweight NERD slab system is used in the duplex apartment intermediate floor due to its low cost and light weight. To assess the structural feasibility, an idealized finite element model was done using the MIDAS GEN commercial package. The conventional type of tall building is modelled using the same software and compared with the duplex model.

In high-rise buildings, providing car parking within apartment buildings often leads to a situation where different grid arrangements exist on the parking and apartment floors. Another grid arrangement for a tall building requires a transfer system, such as a transfer plate or transfer beams. This study explores the transfer plate effect due to the duplex house's architectural form. The feasibility study was carried out with a fifty-seven storey building as a case study. The results obtained from the two analytical models were used to check the structural feasibility of lightweight EPS panels as a load-bearing panel system in duplex apartments.

Keywords: EPS light-weight wall panels, duplex apartments, tall buildings

ACKNOWLEDGEMENTS

I want to thank and express my sincere gratitude to Prof. M.T.R. Jayasinghe and Prof. C.S. Lewangamage for their trust and guidance throughout my MSc research period. They not only encouraged me in my research but also helped me develop my confidence in structural engineering.

I want to express my appreciation to the Department of Civil Engineering, University of Moratuwa; Dr. J.C.P.H. Gamage (Mrs), Dr. H.G.H. Damruwan for their comments and insights at all levels of my progress.

And also, I would like to express my gratitude to Prof. J.M.S.J. Bandara and Prof. S.A.S. Kulathilaka, who were the heads of the Department of Civil Engineering during the duration of my master's, for their help during difficult situations.

I would like to thank Mr. N.S.A. Wanigaratne for assisting me through the computer modelling part of this research. I am incredibly grateful to Mr. N.S.A. Wanigaratne for providing me with financial assistance throughout the year.

For this research, all the technical details about construction using EPS panels were given by Mr. Niranjan Fernando. I highly appreciate and am thankful to him for his support. Furthermore, I at this moment extend my special thanks to Mr. Punithavel Vishnu (Department of Civil Engineering) for his exceptional care taken in my research and his guidance on this study. Finally, I would like to thank Mr. Charaka Satharasinghe for giving me help accessing the research through computer programme installation and licence provision.

Finally, I would like to thank all the academic and non-academic staff of the Civil Engineering department for their kind support during this period.

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LIST OF ABBREVIATIONS

EPS	Expanded Polystyrene Sheets
FEM	Finite Element Model
UDA	Urban Development Authority
PT	Post Tensioned
NERD	National Engineering Research and Development
GCS	Global Coordinate System
SLS	Serviceability Limit State
ULS	Ultimate Limit State