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

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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.

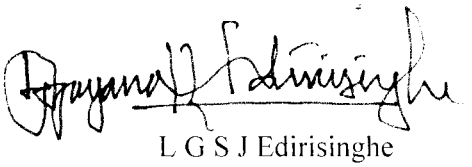
A 40 storey building is analyzed for different lateral load combinations; without basements and without piles, with basement and without piles, without basement and with piles and with basement and with piles. The same scenario is carried out for a 50 storey building.

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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