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EFFECTS OF AXIAL SHORTENING OF COLUMNS IN TALL BUILDINGS

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DECLARATION

I, Wijesooriya Mudiyanselage Vasana Prasanthi Kumari Jayasena, hereby declare that the content of this thesis is the output of original research work carried out over a period of 15 months at the Department of Civil Engineering, University of Moratuwa. Whenever the work done by others was used, it was mentioned appropriately as a reference.

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ABSTRACT

Even today, only a very few number of tall buildings are available in Sri Lanka, compared to other countries in the world. However, with the increase in population and due to the limited space availability the latest trend is to spread buildings vertically than laterally. Nowadays, there is a much greater demand for taller buildings relative to the past.

After concrete was introduced to construction world, it gained many improvements with in a short time period and because of that concrete buildings spread all over the world. Due to the higher strength ranges that can be achieved by good quality concrete, the section dimensions of members in concrete buildings have reduced drastically in the recent past. The increase in height accompanied with the reduced member sizes formed slender buildings, which require more attention focused on the lateral stability of the building. This problem was however solved by the introduction of various efficient structural forms such as shear walls, shear cores, outriggers, etc. in to the building skeleton.

Since the modern tall buildings are made up of smaller members, the vertical deformation of columns, i.e. axial shortening of columns which was considered as of with minor importance up to then, has now become more critical in high rise buildings. The total shortening contributed by creep and shrinkage of concrete and gravity loads applied on structure became more serious as the height of the structure increases. Damages can occur to structural as well as non structural elements due to differential shortening of these vertical members.

The research includes estimation of possible axial shortening of columns in buildings with selected number of storeys. Changes in estimated shortening values were observed with slight modifications to original building configurations. Finally guidelines, which can be used by design engineers at a preliminary design stage and by construction engineers at the time of construction were developed.

Keywords: Concrete buildings

Axial shortening of columns

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