100 Eleventh Avenue

New York, New York

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Senior Thesis Proposal

Executive Summary

100 Eleventh Avenue is a 22-story, 148,000 sf residential building located in Manhattan's West Chelsea District, containing 6,000 sf of street-level retail space in addition to its 55 condominium units. Its defining feature is its facade, a panelized curtainwall system consisting of 1650 windows, each a different size and uniquely oriented in space. The building's superstructure is cast-in-place concrete, with a two-way flat plate floor system. Lateral loads are resisted by shear walls and seven long columns.

The following document proposes an in-depth study of using post-tensioning as a means of reducing the slab thickness of portions of 100 Eleventh Avenue's floor system. Typical slab thickness is 9", with the exception being along the south and west-facing perimeter, where 34' spans and the building facade load dictate an 18.5" slab. This thickened portion is a 9.5'-wide strip along the perimeter of the typical floor, but extends outward on the lower six levels to form the building's balcony system. The proposed thesis will include a redesign of this portion of the slab using post-tensioned tendons and will ultimately compare the redesign to the existing system using criteria such as cost, weight, appearance, and practicality. Because portions of the thickened slab cantilever outwards as balconies, the balcony system will also need to be analyzed to ensure the redesigned slab is sufficiently strong and meets deflection requirements. RAM Concept, in combination with hand calculations, will be used to redesign the system.

In addition to post-tensioning the slab perimeter, post-tensioning will also be looked at to reduce the thickness of a transfer slab found on the 19th floor. A setback requires several columns to transfer at the 19th level. The existing slab is 18.5" thick and reinforced with #10 @ 6" each way on top and bottom and is designed to transfer the column forces. The proposed thesis will study the use of post-tensioned beams as a means of transferring the column forces from the 19th level to the 18th level. Again, RAM Concept will be utilized to redesign the system and will be verified with hand calculations, with the results being compared to the existing design.

In addition to the structural depth described above, the effects of the redesign on the structure's construction process will be used as a breadth topic. Items such as schedule and additional formwork costs will be looked at. Because of 100 Eleventh Avenue's large glass facade, a second breadth study will focus on alternatives to the building's shading system. The current system is made of remote-controlled Lutron roller shades. The intent is to find an alternative system that improves the interior space, while providing adequate shading.