

100 Eleventh Avenue

New York, New York

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Final Report

Executive Summary

The following report is the result of a year-long study conducted of 100 Eleventh Avenue and alternate designs for portions of its structural system. 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 core shear walls and seven long columns.

Alternate designs for two aspects of 100 Eleventh Avenue's structural system were developed. The first of these was the redesign of the building's perimeter slab strip. Due to spans as long as 34 feet and the addition of the glass facade load, the slab was thickened from 9" to 18.5" at this portion of the floor to limit deflections to 1", a requirement given by the facade consultant. The redesign successfully reduced the slab thickness to the 9" thickness found throughout the majority of the floor by post-tensioning this slab strip in one direction with 16 1/2" \varnothing 7-wire strands. Due to site restrictions and architectural restraints, only Floors 7 through 21 can be efficiently post-tensioned. Through a construction management study, it was determined that this post-tensioned redesign reduces the building weight by 5.2%, reduces the cost of the superstructure by \$180,000, and will require 18 additional days to construct. Thus, this design is a very viable option that improves the interior space while reducing the cost of the structure.

The second aspect studied was an alternate design for the 19th level transfer system. The current design transfers the load carried by three columns via an 18.5" slab reinforced by #10's @ 6" o.c. each way and on both top and bottom of slab. In an effort to reduce the material usage and cost, an alternate system of (5) conventionally-reinforced transfer beams was developed. However, the loads and spans were such that deflection limitations and shear/torsion reinforcement requirements could not be met without violating strict floor-to-ceiling heights. Additional criteria rendered this alternate design unsatisfactory, including a worsened exposed soffit appearance and an insignificant reduction in cost of \$15,000.

In addition to the described structural system alternate designs, a breadth study of shading strategies used in 100 Eleventh Avenue was conducted. The implementation of exterior shading was studied as a more effective solution to stopping unwanted direct solar gain from penetrating the glass facade. By extending the facade mullions outward a distance of 3'-2" at every level, the amount of sunlight entering the south-facing windows in the summer would be significantly reduced, while still admitting desirable solar gains in the winter. Despite the increased performance of this proposed shading strategy, however, the impact on the building's aesthetics would likely be too drastic, rendering this an unfavorable solution.