

## **Executive Summary**

The thesis study performed for 800 North Glebe examined the design implications of changing the current slab system to a two-way post-tensioned system and the affects it will have on the lateral force resisting system. To employ an alternative slab system in the building, the bay sizes were reduced from a 30'-0"x46'-0" grid to a 30'-0"x23'-0" grid, thus increasing the total column quantity. The column sizes were reduced on the upper seven levels from 30"x30" to 24"x24". Column grids aligned one another in the superstructure levels, but the interface to the below level parking garage required sloping a row of columns on the first level and adding a corbel-transfer beam system on the first subgrade floor.

The existing system consists of a 9" mildly reinforced one-way slab cast over wide-shallow post-tensioned girders with two "C" shaped core shear walls resisted the lateral load imposed on the structure. The structural depth redesign implemented two-way post-tensioning of an 8" flat slab with banded tendons in the east-west direction and distributed tendons in the north-south direction. Tendons banded over the column strip were analyzed to act as beams within a concrete moment frame. This permitted the lateral force resisting system in the east-west direction to be analyzed as a dual system; a concrete moment frame along with the shear wall core. However, since the code does not specifically address post-tensioned systems as lateral resisting, doctoral research papers were consulted for analysis and recommendations.

Changing the column grid unquestionably affected the architectural floor plans of the building. The existing layout was studied to determine the proper size of rentable offices and workstations and great effort was made to keep the same ratios. So as to not diminish the number of offices available, interior partition walls being moved around were kept to a minimum. Final floor plan redesigns maintained the same quantity of workstations and offices, while meeting all applicable egress codes.

A large part of the buildings appeal is the glass curtain wall sail which spans the entire building, from the ground level retail space to the tenth level offices. Calculated wind pressures from the depth study were used in analyses and it was determined that the 7'-7 ¼" x 5'-0" glass plys and the aluminum mullions were adequately sized to meet all deflection criteria.

The second breadth topic conducted was construction management sequencing and cost analysis of the structural system for both the existing design and the thesis redesign. Because 800 North Glebe is a spec office building, immediate revenue upon completion is a primary concern. The original system was concluded to be more time and cost effective; taking 43 days as compared to 94 days, and costing nearly \$684,000 less.