

## Executive Summary

800 North Glebe offers class-A mixed-use office space and one level of public space located in the newly modified business district of Arlington, Virginia. The overall height of the building is 153'-9" with the ground level as a retail gathering space and nine upper levels of open plan office space with 9'-0" floor-to-ceiling heights. Vertical transportation of stairways and elevators bring you from the three below grade garage, levels to the large open retail and gathering space. Column spacing of 30' x 46' allows for 30,000 square foot floor plates and building setbacks are located at levels four, six, and eight to aesthetically vary the building and offer different office layouts.

The current structural system was reviewed, alternative floor slabs were examined and the lateral system was studied so as to propose an alternative structural design. This new proposal will include a structural depth of changing the existing floor slab to a two-way post-tensioned system, a construction management breadth studying the effects schedule and cost changes to the project and an architectural design breadth due to the new column grid layout impacts and a façade analysis.

A post-tensioned slab system will allow for uniformity of slab type and thickness amount all spaces used throughout the entire superstructure. The current system includes two separate systems with four different slab thicknesses. To implement an effective two-way post-tensioned slab, a new column grid will need to be designed. The effects of an increased number of columns with help with building torsion but will also require transfer girders in the garage to distribute load around parking thruways. Foundations will need to be redesigned because of the forces being redistributed as well.

Due to the use of a singular slab system, the number of different concrete trades will be reduced. However, more specialized post-tensioned laborers and equipment are going to be needed. The changes this will have on the construction management will affect the scheduling, site logistics and project cost. The economical impact will be analyzed to determine if the changes are a feasible alternative.

Increasing the number of columns per level will alter the way floor can be laid out. The current plans will be studied to determine the desired number of offices and alternatives will be configured to best meet the needs of the client while complying with code. The curtail wall system will also be analyzed for thermal and moisture protection, along with the connections to the slab will be considered.

## **Breadth Study I**

The first breadth study will focus on scheduling and cost related to the redesign of the structural system to a two-way post-tensioned slab system. Changing the slabs to a building wide uniform system will have significant changes on the construction process. The management of the construction site would require a new schedule to allow for more post-tensioning equipment and the timing of the contractors and inspections. Microsoft Project would need to be used to allow for critical path and site logistics. In addition, scheduling impacts both the short term and long term cost of construction. Upon completion of the construction process analysis, a conclusion will be drawn with respect to cost and constructability on whether the two-way post-tensioned slab system is a viable alternative.

## **Breadth Study II**

To accommodate for the increase in columns, the architectural floor plans will need to be altered. 800 North Glebe is a mix-use office building offering the tenants class-A space. So as to not diminish the number of offices available, interior partition walls will need to be moved around. The existing layout will be studied to determine the proper size of rentable offices and cubicles and great effort will be made to keep the same ratios. Also, care will need to be given to make sure that the means of egress comply with code.

Also, by creating a uniform slab thickness, the use of perimeter post-tensioned beams may not be needed. If this is the case, the curtain wall system will need to be altered. The connections could be changed to accommodate greater movement or the weight of the system reduced. This will need to be further investigated for feasibility.

## **MAE Course Related Study**

To fulfill MAE requirements for senior thesis, the knowledge learned through master's level courses will be implemented. Information taught in AE 597A, Computer Modeling, will be critical in analyzing the structural system of 800 North Glebe. Even though RAM Concept was not specifically taught, the concepts of meshing, diaphragms and property modifications will be used. Along with AE 597A, the information taught in AE 542, Building Enclosures, will be utilized through the determination of curtain wall systems.