Executive Summary

Parkridge Center – Phase VI is a 7 story 226,000 sq.ft. commercial office building located in Reston, VA. The building is designed to a maximum height of 115'. The south face of the building is made up of sloping columns that slope outward from the ground level to the roof. The north face of the building contains an arcade created by stepped portions of additional floor area on the second floor through the fifth floor.

The existing foundation for Parkridge 6 is a shallow foundation system made up primarily of spread footings. The typical floor is a composite system with 3 ¼" of lightweight concrete on a 2"-20 gauge steel deck. The building grid consists of 3 bays in the N-S direction spaced at 37'-2", 35'-0", and 37'-2" respectively. In the E-W direction there are 10 bays with the first bay on both ends being 25'-8" and all others 25'-0".

The existing lateral system for Parkridge 6 is a series of braced frames. In the N-S direction there are 2 frames and in the E-W direction there are 3 frames. The bracing elements of these frames are made up of HSS sections ranging from 8x8 to 12x12.

The alternative system that was studied for this report was a post-tensioned slab and beam system. For the purposes of this report the post-tensioned system was designed to keep the existing bay dimensions and if possible the existing floor to floor dimensions. The design of the post-tensioned system was accomplished by using the ACI 318-05 manual, the RISA3D application, and the PCA Column application. Excel spreadsheets were also used to expedite calculations.

The post-tensioned slab was found to be a 7 inch slab spanning from beam to beam in the short direction. The post-tensioned beams range from 28in x 38in at the edge to 28in x 34in at the interior on the roof. The concrete strength of the slab is designed to be 5000psi and the beams are 8000psi. Both the slab and beams were designed to be uncracked sections under service loading. There are also sections of beams which are not pot-tensioned to keep beam size variations to a minimum to speed up construction.

The column sizes range from 24in x 28in for the sloping columns to 30in x 34in for the interior columns. The columns are designed to have a concrete strength of 6000psi.

The lateral system was first investigated as a series of moment frames in the N-S direction. However this was found to be inadequate for the lateral loading when considering torsional effects. The next alternative was to use cast-in-place shear walls in both the N-S and E-W directions. The shear walls were designed to be 12 inches wide having a concrete strength of 6000 psi. The overall deflection of the shear walls was well within the H/400 industry standard.

The foundation system will need to be switched from a shallow foundation system to a deep foundation system. The additional loading from the self weight of the concrete system would require either caissons or piles. The foundation system was not explicitly designed in this report.

The cost of the proposed post-tensioned concrete system is approximately $3.5 million a savings of about $3.9 million over the current steel system. The cost saving however is over shadowed by the significantly extended schedule of about 9 months longer than the steel system. The post-tension concrete system will also require specialty shoring for the sloping columns.

The mechanical system was changed from having individual air conditioning units on each floor to two air cooled chiller units on the roof. This system was found to be more efficient for energy and cooling purposes, but not practical as each floor may have different tenants making the billing for the mechanical costs more difficult to split correctly as not to overcharge a tenant.

Overall I do not recommend the proposed post-tensioned floor system for Parkridge Center – Phase VI. The main reasons are the post-tensioned systems increased schedule, impact on the foundation system, and impact on the floor to floor height. It was concluded that the composite steel system was the more efficient system for this building.