EXECUTIVE SUMMARY

This paper is the conclusions of a year's worth of analysis and computations based on the design of the office building at 1000 Continental Square in King of Prussia, PA. The purpose of the calculations presented in this report is to explore the redesign of the structural system in concrete. The building is a high-end office space, featuring large, open floor plans with uninterrupted forty-foot bays along each side of the building. This building is located along the prominent intersection of Pennsylvania Routes 202, 76 and 422; and is in close proximity to a Pennsylvania Turnpike interchange and the King of Prussia Mall. The building has a partially sub-grade ground floor mainly for mechanical systems and storage with five floors of leasable space above that. The existing structural frame is steel with composite concrete slabs, and lateral loads are resisted by two moment frames along the long axis of the building and two eccentrically braced frames along the short axis. The concrete redesign incorporates a pan-joist slab supported on wide beams which also act as components of a moment frame in the long direction of the building. The short axis of the building is laterally supported by two reinforced concrete shear walls with take the place of the two original braced frames. The redesign also includes new concrete column and footing designs.

The results of the redesign show that the concrete system is a feasible alternative to the existing steel system. A quick RS Means estimates shows that the concrete system is only $2.50 more per square foot. This is not so bad considering thinner slab depths, smaller deflections, and more rigid structure. The concrete should also have shorter lead times, but a longer overall construction time. Under the conditions at 1000 Continental Square, there is not decisive reason to switch to the concrete system, however if the project had limitations on vibration, overall height, or serviceability the concrete system would be favored.

There are two breadth studies in architecture and lighting design also included in this thesis. The architectural study resulted in an amusing free-form floor plan with innovative design features. The plan includes serpentine walls which echo features of the building façade, a concentric elliptical reception area inspired by the building's grand lobby, and new modular cubical system that is rearrangeable and expandable to adapt to changing office needs.

The second breadth study was in using daylighting to reduce the number of kilowatt hours expended by fixtures near the building perimeter. The breadth started with the layout of general lighting throughout the cubicle spaces. Then the effects of daylighting were checked under different weather conditions and times of year.

1000 Continental Square was designed to adhere to the 2004 Pennsylvania Uniform Construction Code which references IBC 2003 and ASCE 7-02. This study used IBC 2006 and ASCE 7-05, along with using some estimations and simplifications of floor areas and loadings, which could account for some discrepancies in my calculations when compared to those of the design engineer. Further findings of this report are located in the Conclusions section.