Executive Summary

The ASHA National Office building is an office building located in Rockville, MD. The office tower is five stories and there are two floors of subgrade parking. The parking structure is composed of a flat slab system with drop panels and the superstructure is composite steel. The lateral system consists of four braced frames in the office tower with shear walls in the subgrade parking garage. The gross area of the building is 133,870 square feet.

The goal of this thesis was to redesign the structural system of the office tower as reinforced concrete. Using reinforced concrete would eliminate the need for the baseplates and anchor bolts that are needed to connect the steel office tower to the concrete parking structure below. By designing the entire structure as a reinforced concrete structure, the issue of connecting the steel office tower structure to the concrete parking structure below will be eliminated. In addition, the continuity of the concrete structure will create natural moment connections. The concrete structure will also eliminate the need for spray fire proofing. Reinforced concrete does not require any additional fire proofing treatments which will help reduce the cost of the structure.

Two different concrete floor systems were considered for this thesis redesign. The first floor system that was considered was a two-way flat slab system with drop panels, and the second is a one-way slab and beam system. Both systems were modeled and designed using SPBeam. Due to the irregular shape of the floor plan of the office tower, all column lines had to be modeled. It was determined that the two-way flat slab system would be slightly cheaper, but would create limitations on floor plan flexibility due to the additional columns that are required for this system. For this reason, the one-way slab and beam system was ultimately chosen.

After the structure was designed for the gravity loads, multiple checks were done to determine if the inherent moment connections of the reinforced concrete structure were adequate to resist the lateral loads on the building. ETABS was used to create a computer model of the office building, which was used to analyze the building for the lateral loads. If the structure did not meet these requirements, then shear walls would have to be implemented in the structure of the office tower. It was ultimately determined that the inherent moment connections of the concrete structure are adequate to resist the lateral loads, and shear walls are not needed for the office tower.

A study that explores the architectural affects of changing the structure to concrete was done. If the two-way flat slab system was chosen, it would require the need for two more column lines. The impact of these additional columns on the open office floor space was considered, and the plaza level floor plan was redesigned to accommodate these extra columns. A cubicle layout was also created for part of the plaza level.

A cost estimate and construction schedule was created for the redesigned concrete structure, and compared with the existing steel structure. It was determined that the existing steel structure is cheaper and the construction time is less than the redesigned concrete structure.