Executive Summary

Cambria Suites Hotel is located in Downtown Pittsburgh. The building is approximately 120,000 square foot and is 7 levels above grade. Each story height ranges from 10' to 14', topping out at an overall building height of 102'-2". The current site of the Cambria Suites Hotel was chosen because of the recent construction of the CONSOL Energy Center. For this reason, the site location will remain the same as it serves as a popular attraction to visitors of the City of Pittsburgh and the CONSOL Energy Center.

The final thesis report examines the implications related to redesign the structural system of the Cambria Suites Hotel. The existing design of the building includes load bearing concrete masonry walls, an interior steel frame, hollow-core precast plank floor system, and concrete caisson foundation. The structural system redesign explores the Girder-Slab system which uses specially designed D-Beams and precast concrete floor plank, which eliminates the use of load bearing masonry walls along the exterior of the building. The redesign also examines the layout and design of the lateral force resisting system which comprises of concentrically braced frames.

The steel gravity system resulted in an overall decrease in building weight, which also reduced the base shear and total moment. Since the building weight was reduced, smaller loads will be transferred to the foundation, causing the caissons to be redesigned for the lighter loads. In addition, the total construction time to erect the steel structure was significantly lower than the existing concrete masonry structure. However, the modification to steel slightly increased the total construction cost of the structural system. The lateral force resisting system was sufficiently designed while maintaining an allowable building drift within code limitations. Structurally, the redesign of the gravity and lateral systems prove to be effective and efficient alternatives for the Cambria Suites Hotel.

The façade breadth focused on the architectural impact of changing the existing structural system to steel. This was done by comparing natural daylight penetration against heat transfer through a particular wall system for optimum guest comfort. By implementing the brick veneer system, it provided a lower heat transfer rate as opposed to the curtain wall system. Although the brick veneer system lacks natural daylight entering the building, it creates the most suitable indoor environment for hotel guests.

The overall goal of this thesis report was to design an effective and efficient structural system for the Cambria Suites Hotel. Through extensive research and design, the data and results throughout this report prove that the project goals were clearly met. If a minimal cost increase and minor floor layout changes were not an issue to the building owner, the alternative steel structural system could be implemented as the final design as each study impacts the building in a positive way.