Final Report

Executive Summary

The following document is the final report for senior thesis and includes information regarding the Kaleida Health and University at Buffalo, Global Heart and Vascular Institute. This project will be referred to throughout this report simply as GHVI. This report includes information regarding the building's existing structural system, a gravity and lateral system concrete redesign, a vibration analysis, a construction management breadth, and a mechanical breadth.

GHVI is a ten story medical facility in the city of Buffalo, NY. The building is square in shape with a length and width of 221 feet, and a height of 185 feet. The foundation is made of grade beams and steel helical piles that are driven 82 to 87 feet deep. Floor construction entails composite metal deck resting on steel superstructure. A standard bay size of 31'-6" by 31'-6" is used throughout the building, utilizing W14 columns of varying weight to make up the gravity system. The lateral system is comprised of braced frames which are located near the perimeter of the building.

As part of the gravity system redesign, the three alternative floor systems explored in Technical Report 2 were reevaluated, and the flat slab system with drop panels was chosen as the best option. This system was designed to meet ACI minimum thickness requirements and resist all instances of punching shear. The second part of the gravity redesign was conducted, using RAM Structural System, spColumn, and hand calculations to determine column sizes and reinforcing. The lateral system was redesigned using reinforced concrete shear walls, and drift and relative stiffness checks were performed with the help of an ETABS model.

Due to the large amount of laboratory and procedural space in the building, GHVI is currently designed to meet minimum vibrational velocities. As a part of this thesis, the redesigned concrete floor slab was analyzed using SAP2000 to determine if it did in fact meet those velocity requirements.

A construction management breadth was undertaken for the purpose of comparing the existing steel structure with the redesigned concrete structure. A detailed cost estimate and a schedule analysis were performed for both materials to determine if the concrete building would in fact be more cost effective than the steel building.

In order to reduce the cooling loads of the building and create a more sustainable facility, a mechanical breadth study was performed. Various glazing configurations were investigated and modeled using Trace 700.