Executive Summary

The Hospital Patient Tower is a 12 story expansion to an existing patient tower. This is one of early steps of a large capital expansion plan. This tower utilizes piles and grade beams as a foundation with a concrete structural system. Typical column size is 24" x 24" with varying rebar placement and design of both vertical and horizontal. The new Patient Tower will connect with an existing patient tower by a bank of elevators and will also await the connection of a women's health facility that is one of the next phases of the Capital Improvement Project. Since the Patient Tower needs to line up with the existing structure the floor to floor high is a major consideration in the structural design.

For this thesis report, the goal was to investigate and discuss the effects of redesigning the structural system for the patient tower from its original cast-in-place concrete system to a steel frame system. While redesigning the structural system it was necessary to maintain the architectural plan as to not affect the functionality of the hospital. The two-way concrete slab with concrete shear wall cores was redesigned to a steel frame with "X" bracing. This new system is known as girder-slab and uses a modified wide flange to create a composite action between the precast plank and the wide flanged steel. Preliminary framing elements were sized using the AISC 13th edition Steel Construction Manual and the Girder-Slab Design Guide. An Etabs model was created to design the lateral force resisting system using calculated wind and seismic loads from ASCE 7 -10.

Two breadth studies were conducted for this report to determine how the structural redesign affects other aspects of the building. The first breath topic is a construction management analysis which was performed to investigate and compare the cost and schedule of the existing concrete structure and the proposed steel frame structure. The schedule was compared using R.S. Means construction cost data, an estimated schedule was generated using time acquired from labor crews and unit amounts. From this study it was concluded that both designs have their pros and cons and both of these structures are feasible options for the Hospital Patient Tower.

The second breadth study was an acoustical study to analyze the Sound Transmission Class (STC) and Impact Insulation Class (IIC) for the two Intensive Care Units (ICU) and there adjacent spaces. Both of the towers ICU units are located either above or below a potential noise source. The regular ICU is located above the towers café which will have a large amount of air borne sound and the Nero ICU is located below the mechanical level on the fifth floor which will have high structural borne noise. These two spaces were check for their specific type of noise so that it does not disturb the occupants. In both cases the existing elements of the design were able to meet the criteria needed for the spaces.

Figure 1: Rendering by Wilmot Sanz