

## **EXECUTIVE SUMMARY**

Franklin Square Hospital's new seven story, 356,000 square foot, patient tower addition, located in Baltimore, extends 91.5' in height. It includes an expanded emergency department, 291 private patient rooms, and an ICU department. The patient tower utilizes a mostly concrete structural system, with the few exceptions being a steel canopy and a steel roof system to alleviate large concrete girders considered undesirable by the architect. The connection to the existing hospital is partially steel due to the steel structure of the existing building. Concrete columns, perimeter beams and caissons are utilized in this building along with a flat plate floor system with concrete reinforced moment frames resisting lateral forces.

Technical reports were completed on the existing structure including an exploration of the current structural system, investigation of alternate floor systems, and an in-depth investigation of the concrete lateral resisting system. These reports explored options for the redesign of the patient tower pointing out issues with the current design.

A complete steel design was analyzed for the Patient Tower to decide if it would have been a viable option for design. To avoid creating obstructions, the same column grid was utilized along with an increase of floor to floor height to achieve the same floor to ceiling height as the original design. To keep an open floor plan the option of steel brace frames had to be eliminated as an option although after all analyses were done; it is believed that this system would have been the most logical, economical, and efficient. Unfortunately, this system was not an option due to the architect and owners wishes. Steel moment frames were designed as the redesigned lateral resisting system. The second floor of the patient tower containing the ICU was studied for vibration criteria. Typical connections and spread footings were designed for the new system.

After designing the steel structure an architecture study was completed to ensure the façade would still match the existing building after the increased height. Due to no changes in the column layout, the floor still provided the open floor plan desired. A cost and schedule analysis was generated to complete the comparison. The steel system was estimated to cost 60% more than the concrete structure but reduced construction by 54 days.

The final comparison has determined that the steel design is a viable option for the patient tower but not necessarily a better option than concrete due to cost and additional height. From engineering logic, a steel brace structure would be the most efficient and economical option but further analysis not in the scope of this thesis would need to be conducted to prove this statement. Working with a design team, the structural engineer doesn't have the option to choose between every design. Therefore it is believed that the steel moment frames is a viable option to the concrete structure designed and is a matter of personal preference which is chosen.