Proposal

# Franklin Square Hospital

Baltimore, MD

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Structural Option

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## EXECUTIVE SUMMARY

Franklin Square Hospital's new seven story, 356,000 square foot patient tower addition, located in Baltimore, extends 91.5' in height with floor heights ranging from 12' to 18'. It includes an expanded emergency department with 70 treatment areas, 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, atrium, and roof system to alleviate large concrete girders that the architect did not desire. Concrete columns, perimeter beams, and caissons are utilized in this building along with a flat plate floor system with concrete reinforced moment frames at each column/slab connection resisting lateral forces.

Technical report 1 performed a gravity analysis on the patient tower while technical report 2 explored alternate floor systems. An extensive analysis of the lateral loads and how they are resisted by Franklin Square Hospital is the basis of technical report 3.

After the initial evaluation of the structural system, the building was found to be very heavy. The existing building that the patient tower is attached to utilizes a steel system as well as parts of the patient tower being steel including the roof, atrium, and canopy. The proposed solution is to have Franklin Square Hospital Patient Tower Addition be comprised of a steel structural system. Changing the concrete structure to a steel structure is going to have an impact on many different aspects. A study will be done on the weight that will change the seismic forces. Investigation will be done to determine the most efficient foundation design for the lighter system. Since the patient tower houses very delicate equipment, vibration will be investigated using the AISC Design Guide 11 to prevent fatal consequences. A 3-D model will be created utilizing the education from AE 597A.

Steel moment frames will increase the cost of the lateral system with each steel moment frame costing a considerable amount. Seismically designed steel moment connections will be designed; using knowledge obtained from AE 534, and placed in the most efficient, economical configuration after all configurations are explored for the Patient Tower Addition. Serviceability issues such as drift and overturning will be kept in mind.

As well as the change in structural system, two breadths will be completed. The change from concrete to steel will change the floor-to-floor height immensely. A comprehensive exploration of the architectural impact to the façade will be completed. Since the Patient Tower is an addition to an existing building, the integration of the façade needs to be kept, while still efficiently placing the windows for the patients' comfort. A steel system has a possible effect of a more open floor plan. Changes to the floor plan will also be determined and studied. A comprehensive analysis of the cost and schedule of both the steel and concrete will be completed as a construction management breadth.

## Breadth Topics

### *1) Architectural*

Changing the patient tower's structural system to steel will result in an impact on the architecture of the building. From a preliminary study done in technical report 2, it was found that the floor-to-floor height will increase approximately 16". There was not an issue with height restrictions for the patient tower so this increase will not cause trouble with zoning. The façade will need to change with the increase of approximately 9 feet. Since the patient tower is an addition, the integration of the façade needs to be considered. Sketches of the new façade will be completed, keeping in mind the integration and the comfort of the patients.

Not only will the façade of the building be changed, but the floor plan will have some changes due to the steel system. The current 22"x22" concrete columns will be redesigned using steel W-shapes. Most likely the columns will be able to be incorporated into the walls providing some extra space. Investigations will be conducted to see if this space will increase some of the areas. The free space and the more open floor plan will lend some alternatives to the plan. While the floor plan will provide more flexibility, the design of the architect and the needs of the hospital must be accounted for. Drastic changes will be avoided unless necessary.

### *2) Construction Management*

An exploration of the impact on the schedule and cost of the steel structure will be done to check constructability and feasibility of the new design. A new schedule will be completed to account for the steel construction. Steel fabricators in the area will be researched and incorporated in the schedule including lead time and fabrication.

All available information will be obtained concerning the current schedule and cost. This information will be used to construct a mock schedule. Remaining information that cannot be obtained from the construction management company will be checked with RS Means.

An overall comparison between the concrete and steel systems will assist in determining the advantages and disadvantages of each system. These will be analyzed and a conclusion will be drawn if one system is considerably a better option than the other design.