



## I. EXECUTIVE SUMMARY

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This report evaluates Howard County General Hospital patient tower addition as a cast-in-place concrete structure in comparison to its original design as a composite steel structure. All efforts were made to maintain the floor layout from the original design for architectural purposes.

The floor system was determined to be a 10" slab with 6" drop panels at all column locations. This floor thickness satisfies the flexural requirements with reasonable reinforcing steel and also complied with all deflection requirements. Columns were designed as 24" by 24" sections with typical reinforcing of (8) #8 bars. Normal weight concrete was used throughout the building with a 28 day compressive strength of 5000 psi.

For the existing composite design, it was very important to allow for a great deal of floor plan flexibility as the hospital's needs are ever changing and a future renovation is possible. For this reason, steel moment frames were used. For the new concrete system, it was desirable to maintain this same flexibility, so concrete moment frames were used. Wind loads for the new design were very similar to those for the existing design, however seismic loads greatly increased due to the increased building weight. A lateral analysis proved that the inherent lateral capacity of the slab and column system is sufficient to resist the lateral loads and shear walls were not required.

Wind drift was an issue in the existing composite system. The concrete system provided additional stiffness and resolved this issue as the total wind drift and story drift were both limited to H/400 in the new design. Seismic drift was also within the code mandated limits, proving to be acceptable.

A construction management study was performed to compare the two systems in terms of schedule and cost. It was found that the concrete system saved approximately \$500,000. Both systems resulted in very similar schedules, with construction of the structural systems lasting approximately 16 weeks.

Finally an acoustics study evaluated various acoustical issues. Reverberation time was calculated and found to be between 0.5 and 0.7 seconds, which is assumed to be acceptable for the hospital. I also compared sound transmission through the new floor system and the existing system, finding that the concrete system achieved an STC rating of over 50, while the composite system was slightly below 50. Transmission through the walls was also assessed, as patient privacy is extremely important to the hospital. It was found that the typical partition walls separating the patient rooms have an STC rating of 51, which is above the target STC of 50 and therefore adequate to prevent sound transmission between rooms.

With the design was complete and the performance and cost of the new concrete system compared to that of the existing steel system, the concrete system is recommended over the steel system. Results prove that it performs more efficiently structurally and provided monetary savings.