

Executive Summary

The Hershey Medical Center Children's Hospital is located at 500 University Drive in Hershey, Pennsylvania. The existing structure consists of a composite steel deck floor system utilizing steel moment frames and concentric braced frames. Pile caps comprised of several micropiles provide foundation support for the superstructure. The overall building dimensions are 359.1 feet by 124.25 feet with a total height of 85.5 feet above grade.

The overall focus of this report was to investigate the feasibility of utilizing a reinforced concrete structure over the existing steel design. The secondary focus was to include the effects on the structure caused by the addition of two stories for the future expansion of the Children's Hospital. From this report, it was determined that a 9" flat-slab floor system utilizing 5000 psi reinforced concrete would be adequate for the floor design. Shear caps with a depth of 4.5" help to resist punching shear around each column face. The columns for all levels were determined to be 24" x 24", 20"x20", and 18"x18" square columns with various reinforcing. Lateral resistance is primarily through 16" reinforced concrete shear walls.

The effects of these changes then could be compared by performing a cost analysis for both the existing and proposed designs. It was determined that the proposed design cost more than the existing structure when taking into account only five stories of the proposed design. With the additional two floors, the total project cost was determined to be \$8,137,696.81. Since both construction processes involve different tasks, the estimated project length was calculated to determine which project has a longer time frame. For the existing structural work, it was estimated that it would take 155 days for erection. The proposed design was estimated to take 289 days for the completion of the structural elements.

Through both these studies it can be determined that the proposed reinforced concrete system is a viable option and could have been considered for the overall design. The selection of using structural steel by the design team is unconfirmed. Other constraining factors such as time frames and proposed budgets at the time may have influenced the selection of the five story steel design rather than a 7 story reinforced concrete design.

The curtain wall on the north elevation was also redesigned as part of the building enclosure breadth. The existing curtain wall system consists of vision and spandrel insulating glass units. The heat flow rate was calculated to determine the energy transmitted through the system. An alternative "shadow box" design was proposed which consists of a monolithic glass unit, a 2" air cavity, and 2" rigid insulation. The difference in heat flow between the two designs was quantified into energy savings of \$155,055.60 for the proposed "shadow box" design for the entire curtain wall section. These savings only reflect the results of the heat transfer analysis. Other factors such as manufacturing costs, structural integrity through testing, and the cost due to building life maintenance must be taken into account.