

Executive Summary

The University Medical Center of Princeton (UMCP) is a seven story, 92' tall building that services the medical needs for Princeton students and the members of the surrounding community in Plainsboro, NJ. The superstructure is composed of a steel framing system with composite deck, and the lateral system is designed with a combination of braced frames and moment frames.

This thesis was based on the investigation of a changing UMCP to a reinforced concrete superstructure. The same column layout was used for the redesign. The lateral system changed the steel moment frames to concrete moment frames, and braced frames to concrete shear walls. The lateral system was designed by the loads and deflection from the third wind case determined from ASCE 7-10. All of the structural members were designed by iterating through a compiled spreadsheet of slab, beams, girders, and columns. The redesigned and the existing structure are adequate for serviceability issues, but it was determined that concrete structures are more proficient in vibration concerns.

Since time and money are very important in this market and in general, a cost and schedule analysis was established for both the existing structure and the suggested structure. It was determined that the raw material for the reinforced concrete and placement was \$94,322.28 cheaper than the steel design. After overhead and profit the concrete structure was \$786,922.71 more than the steel structure. Also, while comparing the two schedules of tasks showed that the concrete structure would take approximately 100 days longer than the steel system.

Making the building LEED certified was another option taken into account by trying to improve the UMCP building. Adding a green roof was gave an extra 3000 square feet that the occupants can enjoy which would be accessed from the second floor. This green roof would increase the budget by approximately \$555,000 in initial cost, but there is much payback that comes with a green roof. Also, the roof of the seventh story would implement a cooling roof, which decreases the heat island effect and cuts down on cooling costs in the summer. Other green practices were incorporated into the building, plus the existing HVAC system and curtain wall helped come close to possibly getting a LEED certification for UMCP.

The proposed design would be feasible if you are willing to increases the construction cost plus increasing the length of the schedule. Also, if you implement the sustainability design you can gain an extra 3000 square feet of outdoor space, and save money on the lifecycle cost of the building.