



Executive Summary

The major theme behind my senior thesis research is adding value to Crystal Plaza II via sustainability and energy savings. While the slab penetration study described below falls outside this theme, it is still a value added process to the project in terms of constructability. However, the remaining studies show ways in which the owner could take advantage of new systems that work well with components selected at Crystal Plaza II, or how to utilize the selected components to offset costs.

Consolidation of Slab Penetrations

This depth study into the constructability at Crystal Plaza II looks at the negative effects of the structural reinforcement needed due to reconfiguration of the floor layouts and change in building use. The initial study focuses on the time and cost to the project of taking a do first, check second approach. Following the initial study is a structural analysis breadth showing a potential solution to the issues surrounding the need for structural reinforcement. The results suggest that with early analysis such as that performed, problematic and marginal areas can be identified and accounted for during construction. This also may allow for slight changes in the MEP systems to better accommodate the rebar layout and minimize the reinforcing loss caused by cutting bars. This could potential save 2-5 weeks, and an estimated cost of nearly \$60,000.

Building Integrated Solar Energy Systems

This study looks at the potential to incorporate a building integrated photovoltaic system at Crystal Plaza II. The unique façade allows for easy integration, and the ability for the top 12 floors to remain unshaded by surroundings seems to make this an optimal situation for implementation. However, the efficiency of production and high cost, linked with the large risk associated with the curtain wall contractor and the prefabrication prove to be too much for a viable system. The analysis shows the production in 3 scenarios along with energy savings and a detailed shadow study. Additional work in an electrical breadth provides a schematic design of the inverter and wire sizing to be considered if the system were to be installed.

Peak Demand Shift and Demand Response Programs

This analysis considers different strategies that Crystal Plaza II can implement to create energy savings. Once explained, both peak demand shift and demand response programs are considered using information specific to Crystal Plaza. The outcomes of each show positive cash flows by implementing programs, with demand response providing about \$8,000 a year based on EnergyConnect's system and demand shift providing nearly \$15,000 is savings utilizing the generator.

Financing Projects through Energy Savings and Sustainability

This section confronts an industry issue of energy savings and sustainability while focusing on financing projects. This system is common among performance contractors, but with some slight modifications can be adapted to the building market. Examples using the savings from the generator use show that revenue in the range of \$180,000 per year can be generated from energy savings and used for better equipment or improvements. Also, rebates, tax credits, and incentives will be discussed as ways to lower the initial capital investment of sustainable projects.