

CHRISTOPHER R. STULTZ | CONSTRUCTION MANAGEMENT

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PROJECT | CRYSTAL PLAZA II

LOCATION | ARLINGTON VA

DATE | 12/12/08

THESIS PROPOSAL | BREADTH STUDIES

## **Executive Summary**

This document serves as a proposal for thesis research to be conducted during the spring. The requirements include the need for a minimal two topics of breadth study, a study of a critical industry issue, and connections to graduate level course work. The following topics have been identified as potential areas of research after review of constructability, value engineering, scheduling, and discussions with the construction team. While each analysis is different, there is an underlying theme throughout the proposal of value adding sustainability to Crystal Plaza II. The topics are listed below with descriptions of requirements met and a brief overview of the intended research.

### **Analysis 1: Building Integrated Solar Energy Systems & DC Distribution**

*(MAE-Alternate Power Sources, Sustainability; Breadth- Electrical)*

The first analysis focuses on the rising cost of energy in the United States and a potential way for the owner to supplement these costs. The use of a building integrated solar energy system can provide energy for use within the building or to sell back to the local utility. Recent research has indicated that even non-optimal surfaces can still produce a substantial amount of energy to offset the cost of placing the PV material at a less the favorable location. Also of concern is the distribution and use of this energy. PV's produce their energy as direct current, DC, while nearly all building equipment utilizes AC, or alternating current. The need for an efficient DC distribution system will be evaluated as part of this analysis.

### **Analysis 2: Peak Demand Shift & Demand Response Programs**

*(Breadth- Mechanical/Electrical; Critical Industry Issue)*

This analysis focuses again on the rising cost of energy, but as a critical industry issue in providing alternative uses for equipment to help lower energy costs. This analysis is not focused on energy savings, but on energy cost savings. The research and review of demand response programs, as well as the use of emergency energy generation equipment will be evaluated as ways to shift the building's energy demand spike and sell unused energy back to the utility. Additional research into combined heat and power will also be included, but not as the primary focus, as the emergency energy generation equipment has already been installed.

### **Analysis 3: LEED- Value Engineering Sustainability**

*(MAE-Sustainability)*

The third analysis is based on review of the value engineering performed at Crystal Plaza II. While hindsight always seems to be 20/20, this section will focus on the procedure to value engineer the project and the outcome of eliminating sustainable features. Of primary concern is how to re-evaluate the decisions to eliminate these features and possible ways to reinstate them back into the project by value engineering other areas.

### **Analysis 4: Consolidation of Slab Penetrations**

*(MAE- Virtual Prototype/Modeling; Breadth- Mechanical, Structural)*

The final analysis area will concentrate on the consolidation of mechanical and plumbing risers to lower the number of required slab penetrations. This has a direct effect on budget and schedule as costly structural reinforcement is required to meet the proper structural design loads. The process for structural reinforcement is costly, time consuming, and area intensive. By eliminating the need for some of the many penetrations and evaluating key areas, the structural reinforcement may not be necessary, in effect accelerating the schedule and saving the owner money.

## **Breadth Studies**

### **Analysis 1: Building Integrated Solar Energy Systems & DC Distribution**

The breadth of this analysis will primarily focus on the DC distribution system and the equipment that uses the DC power without the need of an inverter. This provides the opportunity to design a basic system that can then be extrapolated to a larger scale for Crystal Plaza II. The research for the alternative, onsite energy is also outside of the typical construction management topics, but has been researched and presented in prior senior thesis. The intentions for the DC system are to begin with a relatively simple system for a single unit and end with a basic schematic for the building for the scenarios described.

### **Analysis 4: Consolidation of Slab Penetrations**

This analysis provides breath into the mechanical option area as a basic redesign of the distribution system for a typical floor is observed. Outside assistance from industry members will be key to producing a “rule of thumb” system to evaluate the feasibility of consolidating the mechanical and plumbing risers. The goal is to not design the entire distribution system, but rather to design a centralized riser and main branches for a typical floor that allows for individual apartment hook ups. This topic also includes a structural breadth in the calculation of the structural reinforcement. The goal is to avoid the reinforcement, but a structural analysis will be performed to determine the acceptability of the structural integrity.