Christopher R. Stultz | Construction Management

Faculty Consultant | Dr. David Riley

Project | Crystal Plaza II

Location | Arlington VA

Date | 1/15/09

Thesis Proposal | Breadth Studies

Breadth Studies

Analysis 1: Building Integrated Solar Energy Systems & DC Distribution

Breadth in Electrical and Alternative Energy Sources (MAE)

The breadth of this analysis will 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 electrical system that can then be extrapolated to a larger scale for Crystal Plaza II. The analysis will include a basic electrical system for the DC power or the use of an inverter to provide AC power to communal areas. This is not the limit of this technology as it is only an exercise of what is possible. The use of energy in each individual unit is a definite possibility, however, the communal use of energy lends itself to a more owner controlled system that also does not require a compensation plan for those units that may not produce as much as others. 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 a typical floor or the entire building for the BIPV scenarios described. The system will be focused on the communal areas such as hallways, janitorial facilities, mechanical/electrical closets, elevators, and stairwells. The research for the alternative, onsite energy is also outside of the typical construction management topics as it was covered in a graduate level course, but has been researched and presented in prior senior thesis. This topic offers the opportunity to go above the standard curriculum and use topics presented in graduate level classes.

Analysis 4: Consolidation of Slab Penetrations

Breadth in Mechanical and Structural, Opportunities for 4D CAD modeling (MAE)

This breadth analysis provides breath into the mechanical area as a basic redesign of the distribution system for a typical floor. 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 branch system for select risers on a typical floor that allows for individual apartment hook ups, and thus limits the number of slab penetrations that are causing structural issues. This includes sizing of distribution piping and risers and layout of the distribution system to each apartment accounting for obstacles and ceiling heights. Only a single typical floor will be analyzed as many of the same areas and issues are prevalent on all existing floors. This topic also includes a structural breadth in the calculation of the structural reinforcement. A brief study of the current scenario will be analyzed to locate the problematic areas for the structure. This analysis will then lead to the isolation of those risers to be consolidated. The goal is to avoid the reinforcement required due to the penetrations, but a structural analysis will be performed to determine the acceptability of the structural integrity using the same system and calculations as the structural engineer.