

## **Executive Summary**

This proposal serves as an outline for the research and analysis topics proposed for the spring semester thesis. After the initial proposal ideas developed in technical assignment three, the research and analysis topics have been further focused into a few key concepts. The analysis descriptions highlight four main topics which will be the featured focus for the spring thesis with a consistent theme of quality control.

Analysis One includes an analysis of a precast brick exterior wall system as an alternative to the hand-laid brick system. Constructability and Schedule Acceleration will be the two major areas of study within this analysis. Using a 4D construction simulation will help visual understanding and of schedule implications. Finally, a cost and quality analysis will be performed.

Analysis Two includes the analysis of a reduced load on the roof's structural system based on a selection of an alternative "cool" roof system to the current green roof. The use of RAM Structural software to help calculate loads will help determine smaller steel members and re-design the roof structure. A life cycle cost analysis will also be developed to compare the two different systems. Quality issues with field installation will also be looked into.

Analysis Three includes analysis on the benefits and ability of leveraging a Building Information Model (BIM) for prefabrication. Also, the comparison of field quality control strategies in conjunction with the BIM model can determine "best practices" which can make a case for using a BIM model on this project.

Analysis Four includes the analysis of the electrical loads on the building and sizing a transformer with the building's expected power load and the grid tie in mind. Also, a comparison of quality control strategies which can be incorporated during the electrical design can determine "best practices" which can be followed by project teams.

A weight matrix is provided to show how much emphasis will be placed on the core areas of research, value engineering, constructability, and schedule acceleration. A detailed explanation of breadth studies can be found within Appendix A. Breadth will be performed in the areas of structural and electrical.

## **Appendix A: Breadth Studies**

The breadth studies topics involve analysis and understanding outside a students' distinct technical discipline/option within the Architectural Engineering major.

### **Breadth One: Structural**

After analyzing an alternative roof system, a reduced dead load will occur from removing the green roof. Using the RAM Structural application, loads will be calculated for redesign roof's structural system and member sizing can be evaluated. The system will then be re-designed with a reduction in steel member sizes which could be potentially significant.

### **Breadth Two: Electrical**

The electrical design loads for the buildings' electrical distribution system will be analyzed. The comparison to the installed system and calculations for sizing the electrical transformer will be conducted. This will provide a comparison to the required size of electrical transformer needed to the 750kVa transformer that was installed to replace the original 300kVa transformer which failed due to a phase loss issue.

### **MAE Requirements:**

To satisfy the MAE requirement, I will be demonstrating knowledge learned from AE 542: Building Enclosure Science and Design which focuses on developing an understanding of the nature, importance, functions, and performance of the building envelope in general. This will be valuable for my analysis of the Brick Façade and Roofing Systems.

I will also demonstrate knowledge gained from AE 597D: Sustainable Building Methods which focuses on strategies and technologies for green buildings and sustainable construction and an understanding of how to minimize the impacts of buildings on the environment. I will use this knowledge in deciding on alternative materials through value engineering such as a precast brick wall system and a light "cool" roof system.

Additionally, methods taught in AE 572: Project Development and Delivery Planning will be used to create a life-cycle cost analysis between the green roof and alternative "cool" roof system to determine the feasibility of each system and the financial benefit to the owner.