Loyola Intercollegiate Athletic Complex
Baltimore, MD

Thesis Proposal

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Executive Summary

The proposal that follows is an outline that will guide research for the Spring 2010 semester. It identifies three areas of analysis. First, I am going to look at getting the project a LEED rating. Here the project will be analyzed to see the benefits and costs of LEED. Next, I will take a look at a prefabricated façade system over the current masonry work. During this analysis, a breadth study in mechanical and structural will be completed. The mechanical study involves looking at the thermal properties of the wall and resizing the mechanical equipment. The structural study takes a look at the current structural system design loads and compares them to the new loads of the prefabricated façade. The last analysis will be implementing BIM on this project. Here I am going to look into the costs, benefits, and schedule impacts of BIM. A weight matrix establishing the expected distribution of time is also included.

A. Analysis 1- LEED Rating Goal for the Project

A.1 Problem Statement

The Loyola Intercollegiate Athletic Complex is not seeking any LEED rating from the United States Green Build Council (USGBC). Currently, there are multiple areas that would award LEED points based on the LEED Version 2.1 Rating System. My goal for this analysis would be:

- calculate the upfront costs of setting up the LEED program onsite
- the manpower it will take to set up the program
- if this will have an impact on the schedule
- analyze the possible current credits
- research the current materials and find alternatives to accommodate LEED points

A.2 Methodology

- Conduct interviews with the owner to establish the perceived value added by obtaining a LEED rating
- Consult with the project team on the Millennium Science Complex on their methods of setting up the LEED program
- Consult with owners that asked for LEED halfway through construction and ask if it was worth the added costs
- Identify credits to research further
- Send out questionnaire to LEED projects to obtain more knowledge on specific points to go after and ideas for changing materials out
- Establish best choice of credits that can be pursued to obtain a LEED rating

A.3 Resources

- Loyola Intercollegiate Athletic Complex
- CM faculty
- USGBC Version 2.1 Reference Guide
- Whiting-Turner

A.4 Outcome

Through this analysis, I expect to find the costs associated with pursuing a LEED rating for the Intercollegiate Athletic Complex. A more sustainable building for the project owner will make the new stadium more environmentally friendly and marketable to the surrounding area. I

expect there to be an increase in cost with obtaining a LEED rating, but may be acceptable by the value added to the owner.

A.5 Thesis Requirements Fulfilled

- Critical Issues Research
- Value Engineering

B. Analysis 2-Prefabricated Façade System

B.1 Problem Statement

The masonry façade currently on the project is mainly located on the first two floors of the stadium and the stair towers. The exterior studs, insulation, and sheathing are completed by a separate contractor and as separate activities that include more time, labor, and coordination. The goal of the research is to combine the exterior façade, exterior studs, insulation and sheathing into one precast wall unit. Also, to determine how effective, from a cost and schedule standpoint, the use of this precast panel wall unit would be over the masonry work. I will look at the precast concrete façade versus the current structure of the building to determine if the current structure can withhold. Another goal is to determine if the thermal properties of the precast wall panels could reduce the mechanical load and allow for a resizing of the air handling units.

B.2 Methodology

- Identify a proper precast wall system that would work for this application
- Research the wall system to determine the loads for the structure and the thermal properties of the wall
- Interview project managers that have used this product
- Obtain original design loads from Hope Furrer
- Calculate new loads in the areas of the building with the precast wall system and compare them to the original design loads
- Compare thermal properties of the precast system with current system to form a more energy efficient façade

B.3 Resources

- Structural AE Faculty
- Mechanical AE Faculty
- Whiting-Turner
- Hope Furrer
- AISC Manual
- AE 310 Material

B.4 Outcome

Through this analysis, I plan on finding the initial costs to be higher but the savings to come from schedule reduction, coordination meetings, and thermal reduction for resizing of the air handling units. The precast erector can erect the precast panels faster than the masonry work can lay brick; this is where the schedule reduction comes from. Since there are only two subcontractors to deal with instead of four, the coordination meetings are significantly reduced. The added weight from the precast panels could potentially add steel and the need for a redesign of the structure.

B.5 Thesis Requirements Fulfilled

- Schedule Reduction
- Value Engineering
- Constructability review
- Mechanical Breadth Study
- Structural Breadth Study

C. Analysis 3- BIM Implementation

C.1 Problem Statement

Building Information Modeling (BIM) is beginning to be more widely accepted and understood in the construction industry, but still has many questions surrounding implementation. Project teams and companies can know that they want to use BIM, but may not understand how to best implement it on their projects. Critical understanding as to the processes of construction and the required information transfers at each step can help to improve this understanding and create process models to BIM processes and information could prove to be a valuable step in understanding and identifying how BIM can best be implemented on a project.

C.2 Methodology

- 4D analysis of all the schedule impacts from the above research
- Information will be gathered for this model through interviews with the project team
- Look at current projects that are utilizing BIM and have BIM execution plans
- Look at current software to utilize, some software is Navisworks, Revit, and Synchro
- Create a project specific BIM Execution Plan and Implement it to determine the cost and schedule impacts it has on a project

C.3 Resources

- Penn State's BIM Execution Plan
- Whiting-Turner
- AE Faculty (Dr. Messner and his graduate students)

C.4 Outcome

Interfaces between companies, people, and different information sources will be the areas that can be expected to have the most knowledge to be gained. At this point, transfer of information is critical, and has the biggest opportunity to be lost. Through incorporation of BIM, an intelligent model, and carefully laid out execution tips, a process that can help simplify BIM implementation will begin to emerge.

C.5 Thesis Requirements Fulfilled

- Constructability Review
- Schedule Reduction
- Research

D. Breadth Topics

D.1 Structural Breadth

The current façade is made up of ground faced CMU with metal stud backup, sheathing, insulation, and a vapor barrier. Changing the CMU façade out with a prefabricated wall system will add extra loads onto the current structure.

This change is going to be analyzed to determine the effects of these loads on the existing structure. After the added loads are determined, I will compare these loads to the existing structure to determine if more supports are needed. Any additional supports that are determined to be required will be designed and evaluated for cost and schedule impacts.

D.2 Mechanical Breadth

Currently the building consists of 8 Energy Recovery Units, 70 heat pumps, and 14 electric unit heaters. When the current CMU with metal backup wall system is replaced with the prefabricated wall system, less error between all the different trades will occur causing the wall to have better thermal efficiency.

This change is going to analyze the wall system that achieves the best thermal properties for the building by testing different types of prefabricated wall systems. I will then select a wall system and determine the thermal efficiency of the selected wall system. Finally, new loads will be calculated to determine if the mechanical equipment can be resized and evaluated for cost and schedule impacts.

E. Weight Matrix

Table 1: Weight Matrix

Value Engineering Ideas	Research	Value Eng.	Const. Review	Schedule Red.	Total
LEED Rating Goal For Project	15%	10%			25%
Prefabricated Façade System	15%	10%	10%	5%	40%
BIM Implementation	15%		10%	10%	35%
Total	45%	20%	20%	15%	100%