

THE PENNSYLVANIA STATE UNIVERSITY –
DEPARTMENT OF ARCHITECTURAL ENGINEERING

AE Fifth Year Senior Thesis

Executive Summary & Breadth Studies of Thesis Proposal

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The Carl J. & Ruth Shapiro Cardiovascular Center at the Brigham & Women's Hospital in Boston MA



Executive Summary

Through the three Technical Reports, the project systems and construction methods gave way for the author to discover areas of the project that led to problems or construction issues that could potentially lead to construction issues. The following proposal is the opportunity to analyze three such problem identification areas, research the facets of each, and come up with innovative solutions that could improve the quality of the project.

Each year at the PACE (Partnership for Achieving Construction Excellence) Roundtable, students are introduced to critical construction issues in a discussion format with industry members. These critical issues can help students gain an interest and comprehension for the complexities inherent in construction practices, and also to recognize how those same issues can be applied to their own thesis projects. The issues from this year were BIM, prefabrication, and workforce relations, and the key contacts that this student could call upon are identified as well. From this, the most interesting for me was the Building Information Modeling and its growing use in the industry today.

More of a central theme, BIM will be part of the three technical analysis areas encompassing the remainder of my thesis proposal. Research into the design of the façade connections of the bridge spanning the existing hospital to the new Carl J. and Ruth Shapiro Cardiovascular Center is followed by an exploration of the acoustical complications with having a generator above the VIP patient rooms on the 10th floor of the new building, and finally finishing the analysis topics will be a critical look into the Curtain Wall system and the construction solutions for it on the project. A fourth technical analysis topic involves a second topic discussed at the PACE Roundtable, prefabrication. The finishing of the concrete floors has caused issues with the LEED-appointed adhesives used by the flooring subcontractor. So a look into using precast concrete floor slabs in the place of the cast-in-place concrete floors makes up a fourth analysis topic which may or may not be explored for the final proposal in Spring 2008. For a more in-depth description of the breadth studies in these technical analyses, refer to Appendix A.

The overall goal of this thesis proposal is to generate innovative solutions that incorporate the topics of the construction management classes (Schedule Reduction, Cost Savings, Value Engineering) with the breadth studies associated with Structural or Mechanical options in Architectural Engineering. These solutions will require research and development, as well as designing and modeling in 3-D and 4-D representations, and the weight matrix provided in the final section of the proposal indicates specific percentages of time allotted to these topics.



Breadth Studies Summary

Through the course of researching each technical analysis topic, each incorporates components of other disciplines of Architectural Engineering. These breadth studies are taken from Structural, Mechanical, or Lighting/Electrical options studies, and are interwoven into the analysis subjects listed in this proposal. This section was specially prepared to better explain the breadth study component for the analyses, and also to prepare the breadth studies segments of the Executive Summary and also for the CPEP website component.

Analysis 1 Breadth: Since this analysis revolves around bridge design, considerable attention will be spent on the structural impact of changing the bridge connections to the façades. The structural analysis of the bridge with dead and live loads will be needed for both the existing design and any changed designs in order to choose the best application of connections to the existing hospital. This may involve also wind lateral loading conditions, snow loads, and any other structural components that may compromise the bridge connections.

Analysis 2 Breadth: This analysis focuses on mechanical systems and acoustics as breadth topics. For the mechanical side of the breadth analysis, the HVAC systems and generators put out so much vibration and sound, and this will be analyzed. Acoustically, the vibrations and sound dampening must be determined and analyzed to find the appropriate materials to meet the requirements. These will then be used to compare with the design choices made for the project.

Analysis 3 and 4 Breadths: Both of these analyses involve a great amount of structural breadth opportunities. The curtain wall system must repel certain wind loads, has some load attributed to it, and both of these are considered when structural design occurs. Thus any change to the design of the curtain wall system dramatically impacts the structure. In the floor system analysis, the cast-in-place concrete must meet certain engineered strength requirements, and a precast floor system designed to replace the cast-in-place floor system must meet the same requirements. Also, the precast system might have other strength issues that must be addressed, i.e. the connection between floor slabs, if not properly grouted, could compromise the structure.