



OPPIN STATE UNIVERSITY
HEALTH & HUMAN SERVICES BUILDING
BALTIMORE, MARYLAND



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TECHNICAL ASSIGNMENT #3

ALTERNATIVE METHODS AND RESEARCH

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A. EXECUTIVE SUMMARY

This document is intended to outline the issues I plan to research in the spring. The PACE Roundtable helped to identify many industry and technical issues. A summary of the three sessions I attended is provided in **Section B** on page 3. My industry research will discuss ways to protect a guaranteed maximum price (GMP) or estimate in the current market. I plan to focus my technical research on Coppin State University Health and Human Services Building's building envelope and mechanical system. The building envelope research will concentrate on pre-fabrication, constructability and schedule reduction. The mechanical system will deal with constructability and value engineering. The changes made to the building envelope and mechanical system will then be analyzed for energy efficiency.



B. CRITICAL INDUSTRY ISSUES PACE ROUNDTABLE – BUILDING RESPECT

Session 1: Building Systems Challenges 1a- Structural Building Systems

Dr. Messner started the session out by having everyone go around the room and pair up to introduce the other person. I had the opportunity to meet Dave Flickinger the 1997 S:PACE President from Alexander Building Construction. He is in the process building a multi-use academic facility that is a lot like Coppin State University. We spoke briefly about his building's envelope. He gave me his card and I think that he will be a good contact for my research.

Recent trends in the market were discussed first. Progressive collapse was identified as the biggest change in the Washington DC market since 9/11. I don't think that this would be a good topic of research for my building. The discussion then turned to different ways the skin is attached to the structure of a building. Most of the industry members agreed that the coordination is not well thought out during the design of the structure. Katie Lynahan discussed the difficulty of coordinating the steel with the glazing on the Coppin State Project.

Industry members had a few different ideas about how to make the coordination between the structure and the building envelope coordination a better process. Some industry members believe that the glazing and/or masonry contractor should be on board when decisions about steel fabrication are made. This will allow the coordination process to be more of a compromise rather than the glazing contractor having to just deal with the decisions made by the steel contractor. An even better solution to this problem would be to have a more Design Build delivery method for these trades.

There were many different issues with coordination at Coppin State. I think it would be interesting to estimate the amount of change orders that have been submitted due to the inability or un-constructability of the design. Maybe I could compare a few different academic facilities' change orders that were Design Build instead of a more traditional delivery method. I would also like to do look into the details of the attachment of the glazing to the

structural system at Coppin State. During the Glazing Pre-Bid Meeting, many contractors had issues with some connection details.

Session 2: Building Information Modeling Technology

2D- Team Dynamics and Communication with BIM

This summer I had difficulty understanding why the steel fabricator was doing most of the engineering of the connections instead of the designer engineer. I thought that attending this discussion instead of the others would help me understand the roles of each member of the project team and how BIM would affect these roles. This summer we had numerous steel related RFI's asking about missing dimensions. I think that having an electronic model would allow contractors to pull dimensions off of the model and not having to worry about all of the paperwork and time involved with RFI's and unapproved submittals.

Industry members had the understanding that as BIM breaks into the market Design Build will become increasingly more popular and necessary. This relates to issues that interested me in the previous session (Building Systems Challenges - Structural Systems). Including a BIM modeling in the design process will help to eliminate a lot of coordination and construction issues. Most industry members believe that until the designer saves money the process will not change. The cost savings of BIM is most beneficial to the CM and contractors.

I would be interested in developing a survey for design professionals regarding BIM and Design Build. It is my opinion that the time spent on the model would take less time than answering numerous RFI's and having to review a submittal multiple times before it is correct. I enjoyed listening to the opinions of the construction industry but I would like to hear the designers' opinions.

John Bechtel and I had the chance to discuss BIM during the break after this session. I think that he will be a good contact because of his experience and availability. He seems to have a lot of opinions about the process. In my experience working at OPP, they seem to be somewhat disorganized. If Penn State OPP requires a BIM to be submitted after the completion of each building it may help their organization if utilized correctly.

Session 3: Building Respect...

3a- Design Professionals

The discussion in the previous two sessions touched upon the relationship between designers and construction managers. I attended this session because I am already starting to see a split in the 5th year AE class between the designing and the CM students. This summer it was especially interesting to see the interaction between the superintendent and the design team.

Industry members stressed the importance of the relationship without work involved. Finding a common interest and being able to see the designer as a person goes a long way. Partnering sessions were discussed and most industry members were not fans. Jeremy Sibert from Hensel Phelps discussed the success of the focus meetings that are held weekly by his project team. This allows all of the members of the project team to put any problems on the table before they become major issues in the construction process.

I think it would be interesting to research the way that teams interact. Emotional IQ testing was discussed by Dr. Riley at the PACE Advisory Board meeting. I think that comparing successful teams' dynamics to unsuccessful teams would be beneficial. I would like to compare not just constructions project teams but also other kinds of teams, maybe sports teams.



C. CRITICAL ISSUES RESEARCH METHOD

Problem

In the current market the cost of materials and labor can change drastically over a short interval of time. The increased costs affect the owner, designer, construction manager, and contractor. The Barton Malow Estimators developed a cost for the CSU-HHSB which the owner used to set a price with the state of Maryland. Weeks after the price was agreed upon Hurricane Katrina hit and significantly escalated material prices. After speaking with industry members at the PACE Roundtable, I found that many other projects experienced this same problem.

Solution

This problem can be solved by locking in material prices with contractors earlier. I plan on speaking with owners, designers, construction managers, contractors and insurance companies about different possible solutions. The construction industry is not the only industry who has dealt with escalated prices, speaking with other industries about their current solutions may provide a solution for the construction industry.



D. PROBLEM IDENTIFICATION

The
 Building Envelope

There are several materials that encompass the building envelope. This could lead to several different analyses.

Problem	Possible Solution
Multiple materials coming together all over the building allows for leakage.	Consider using a pre-cast system.
Constructability and integrity of numerous different details. One example is a hanging brick shelf that allows for vertical movement and is difficult to fabricate.	Analyze and possibly changed different details depending on time and/or cost savings.
The cost vs. the value of the eyebrow sunscreen.	Evaluate reasons why it was not Value Engineered and if it should be considered.
Multiple materials means that multiple subcontractors were needed to complete the project.	Calculate the number of crews and man-hours of both the current envelope and a precast system.

Solution

Below is the main solution that will aid in solving all of the above problems and how it will help each party involved.

Solution	Owner	Designer	CM
Pre-Fabricated Exterior System	Help reduce cost and schedule	Less re-design of details due to factory conditions	Reduced constructability issues, lower escalated labor prices, reduction of schedule

Mechanical System

Over the course of the conception of this project, the mechanical system has been changed and value engineered. Some of the decisions made in the process provide a good opportunity for analysis.

Problem	Possible Solution
The air handling units started out as custom and changed to semi-custom. The units now sit on an over-sized isolation slab.	Compare all costs associated with the custom unit, semi-custom unit and a non-custom unit.
Baseboard heaters exist in most rooms.	The use of higher quality glass and the elimination of the baseboard heaters.
The ductwork was not changed with the change in the air handling units.	The downsize of the air handling unit may allow for the downsize of the duct work and the reduction of sheet metal.

Solution

All of the above solutions will be considered especially the value of value engineering. Below is a break down of how value engineering affects each party.

Solution	Owner	Designer	CM
Value Engineering	Reduces Cost	More design issues that are unexpected	Initial reduction of cost that hurts productivity and constructability



D. TECHNICAL ANALYSIS METHODS

Building Envelope

The research for the problems associated with the building envelope will entail talking most importantly to pre-fabrication contractors. The comparison of pre-fabricated buildings and stick built buildings will also be critical in explaining benefits and problems. This comparison will involve the opinions of all parties who have worked on both kinds of buildings. The focus will be on constructability, cost savings, and schedule reduction.

Mechanical System

The mechanical system will be analyzed for the benefits of value engineering decisions made. This will entail talking to the design team and the contractor who developed the idea. A cost analysis of the changes after a re-design has been performed will be analyzed.

Energy Savings

Once the building envelope has been re-designed as a pre-fabricated system instead of a stick-built system I plan on doing an energy analysis of the building. This will include changes to the mechanical system.



F. WEIGHT MATRIX

The matrix below depicts how I plan to distribute the time spent on my senior thesis.

Description	Research	Value Engineering	Constructability Review	Schedule Reduction	Total
Analysis 1 - Building Envelope	5%	5%	50%	40%	100%
Analysis 2 - Mechanical System	5%	60%	20%	15%	100%
Analysis 3 - Energy Savings	5%	30%	35%	30%	100%
Issues Research - GMP Protection	85%	5%	5%	5%	100%
Total	100%	100%	110%	90%	