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Technical Assignment 3



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Executive Summary

Through completion of this technical assignment, critical and technical issues facing both the construction industry and the Franklin & Marshall College Row project were introduced as a summary of ideas that will be further researched and analyzed. Included in these analyses are subjects of value engineering, constructability, and schedule reduction.

Meeting a tight schedule is a major concern for Franklin & Marshall College. Their goal is to be able to use their three new buildings in time for the 2007/2008 school year. To ensure that the buildings are turned-over to the owner, with enough time for the college to prepare for the school year, Alexander Building Construction was charged with developing a schedule that would meet the owner's needs. A tight schedule allows for schedule reduction analyses that will be addressed in the structural flooring system and steel prefabrication issues.

Another concern a college has is maintenance. Since the college will be the one using the building for the next number of years, maintaining that building is key in reducing cost over the years to come. Maintenance concerns are addressed in the analyses of the conveying system and using Building Information Modeling as part of the construction process and for the as-builts at the end of the project.

Critical Industry Issues

The 15th Annual PACE Roundtable was held on October 12, 2006 at The Penn Stater Conference Center Hotel. The overall theme of the event was “Building Respect”. Through various sessions, breaks, and a team building activity, industry professionals, students, and faculty had the opportunity to interact and share thoughts on current issues facing the construction industry.

During the first session, the groups looked at technical building systems challenges. The discussion group I attended was “Start-up, Operations, and Maintenance – In-house Teams and Business Development”. The session began with the question, “What are the most common form of call-backs and maintenance problems in recently completed buildings?” Right away the first response was “too hot or cold”. Also addressed were leaks, training for maintenance workers, AHU’s not working properly, plumbing not functioning correctly, and door hardware mishaps. This led to the question, “How do we address these complaints?” Ideas here included more detailed commissioning, involving the commissioner in the design process, leaving enough time for start-up, and having the right person overseeing the commissioning process. The discussion then turned to Green Buildings. Also discussed were warranty start times, the pros and cons of having a third party agent or an in-house agent, commissioning on different types of projects, and the cost savings related to properly maintaining systems. To finish up, possible research topics for thesis students were suggested, including as-built drawing accuracy and electronic document storage.

The second session of the morning focused on Building Information Modeling (BIM) technology. I attended the BIM session which focused on “BIM: Education and Workforce Development – Who Will Lead BIM Teams”. The discussion started by addressing the introduction of BIM in the field and to current employees and taking the time to train them. Current industry professionals do not expect graduating students to have knowledge of BIM. It was suggested that a course on BIM’s could be an elective now, and as interest increases in the industry, that it become a requirement. The current interest in the industry seems to mainly be as owners desire to use BIM’s. Time and costs benefits are not necessarily apparent in coordination or would not benefit an estimator if it became more time consuming, but it may benefit the owner to see their building in 3D or for verification in a court case. For BIM’s to be effective, scheduling and 3D modeling should be learned together.

In the afternoon session, the groups discussed how to build respect with players in the construction industry. During the session I attended, "Brainstorming: Building Respect with Owners and Operators", honesty was a very common theme. Communicating with the owner that construction is not perfect and having guidelines for how to address issues that come up is important. Follow through on commitments made to the owner, as well as delivering both the good and the bad news, is a key way to gain respect. Understanding that different projects bring on different levels of owners, whether it's their knowledge level or the levels of their company they may have to go through to make decisions. The discussion led to indicators that your owner is satisfied, such as positive feedback, receiving future work, free flow of ideas, and reputation. A question arose on where you draw the line between the contractor and the owner. That depends on the type of contract. Respect is lost faster than it is earned. This can happen by not meeting goals, unbalance of responsibilities, and being dishonest. The discussion finished up with many thesis research suggestions, such as benefits and limitations of partnering and personality trait differences between a repeat owner and a single-time owner.

The team building activity after lunch involved building a tower out of a deck of cards. During the first round, we were given a deck of cards and four minutes to build a tower. After that, we were given a second deck of cards and time for planning before another four minutes for construction. There were apparent differences between the two rounds. The first round was much more noisy and confusing, and groups were looking to other groups for ideas. After planning, the second round was much quieter and the towers looked more alike overall.

Overall, as a 5th year student currently in thesis, the PACE Roundtable was a beneficial experience. Throughout the day, industry members presented ideas to the students that could be used as plausible research topics for their thesis projects. A majority of the industry professionals expressed their willingness to help the students with their research. Chris Magent of Alexander Building Construction had good ideas for commissioning, along with John Bechtel of Penn State's OPP. Jim Faust of HSC Builders was very eager to talk about adopting BIM methods into the industry. For the last session of the day, Bennie Kovach of Forrester Construction had very good input on owner relations.

I found the first session of the day, “Start-up, Operations, and Maintenance” to be the most beneficial toward my thesis research topic ideas. Possible research topics may include looking into the accuracy of as-built drawings and the use of electronic drawings for easier updates when things are changed. The afternoon session also presented a good array of possible thesis research project ideas. Topics that I found interesting included personality trait differences between a repeat owner job and a single-time owner and the benefits and limitations of partnering because that alone will not automatically build respect.

The most surprising thing to me was the industry professionals’ take on BIM. I wouldn’t say that the overall tone from the industry members in the room was negative. The concern from the industry seemed to be more along the line of if the benefit of using BIM worth the time lost for training.

Critical Issues Research Method

An important critical issue facing the construction industry presently is the adoption of building information modeling (BIM) software into a project. Although, 4D modeling is not commonly used in the industry at present, there is new technology coming out that may increase the quality of an overall project if adapted by a project team.

Problem Statement:

What are the benefits and drawbacks to utilizing BIM software at the beginning of a project and for as-built drawings?

Proposed Solution:

Currently it seems like the industry is not completely informed on the subject matter and do not realize the benefits that using BIM could have on their projects. If persons were better informed, BIM's may become more popular on construction projects.

Research Steps:

In order to research this problem, I plan to perform the following activities:

- ✦ Review literature on the subject matter
- ✦ Interview owners and contractors as to their take on utilizing BIM's on a project

	Interview/Survey Questions
1	In general, how do you feel about utilizing BIM's on a construction project?
2	What are the benefits as an owner (contractor, etc.)?
3	What are the drawbacks?
4	Do you feel BIM's can be beneficial in the years after a project is completed?
5	Have you worked on a project previously or currently that has used a form of BIM?
6	Do you think it would be beneficial for BIM to be integrated into the curriculum?

- ✦ Review software costs and training

Expected Outcomes:

BIM's, when utilized at the beginning of a project can help to coordinate trades, help an owner to understand their finished product and therefore recognize changes they may desire early-on, and can also help to create a thorough set of as-builts. Also, BIM's can take on a negative reaction in a project by occupying inexperienced contractors' time.

Problem Identification

Below is a list of ideas for possible alternative methods and research topics for Franklin & Marshall College Row in Lancaster, PA.

1. Structural – Analyze use of all composite metal deck flooring system v. precast concrete plank system. Analyze cost and schedule between the two systems.
2. Conveying – Hydraulic v. traction elevators. Traction elevator reduces needed mechanical space. What are cost comparisons between the two systems?
3. Prefabrication – How to ensure timely procurement of steel on a time sensitive project.
4. Building Information Modeling (BIM) – Benefits v. drawbacks in relation to owner and contractor participation and wants.

Technical Analysis Methods

Technical issues being analyzed for the Franklin & Marshall College Row project will consist of the following three topics. Included are methods for carrying out this research. Areas to be considered are value engineering, constructability, and schedule reduction.

1. Composite Metal Deck v. Precast Planks

Problem Statement:

Currently the flooring system consists of a slab on grade, a slab on deck for the second floor, and the four remaining floors are precast planks. What are the cost and schedule impacts and how do they affect the project?

Proposed Solution:

Provide information comparing benefits and drawbacks of the two systems.

Research Steps:

In order to research this issue, I plan to perform the following activities:

- ✦ Analyze the schedule
- ✦ Analyze the cost
- ✦ Analyze resource allocation
- ✦ Minor re-design
- ✦ Interview both cast-in-place and precast concrete contractors

Expected Outcomes:

Precast may help to accelerate the schedule. Cost savings might come into play in both the material and in the resources for doing the upper floors as slab on deck.

2. Hydraulic v. Traction Elevators

Problem Statement:

Currently, the design for the conveying system is Gen2 elevators from Otis Elevators. What are the cost impacts, as well as the space allocation and maintenance requirements, related to both conveying systems?

Proposed Solution:

Provide information comparing benefits and drawbacks of the two systems.

Research Steps:

In order to research this issue, I plan to perform the following activities:

- ✦ Analyze the cost
- ✦ Analyze maintenance requirements
- ✦ Minor re-design
- ✦ Interview elevator suppliers

Expected Outcomes:

Traction elevators may have a higher first-cost, but there are benefits in they do not require as much maintenance and do not take up as much space as a traditional hydraulic elevator.

3. Prefabrication

Problem Statement:

How does management ensure the timely fabrication and arrival of steel members onto construction site?

Proposed Solution:

Visits to the fabrication shop as well as weekly updates on fabrication schedule must be implemented to ensure the members will be ready on-time and delivered to site when needed.

Research Steps:

In order to research this issue, I plan to perform the following activities:

- ✦ Analyze the schedule - both in the fabrication shop and the construction schedule
- ✦ Analyze resource allocation
- ✦ Interview steel manufacturers and contractors

Expected Outcomes:

Devise a plan to communicate between construction site and fabrication shop the needs of the two and how to resolve any scheduling issues that will result in the timely construction of structural steel on site.

Weight Matrix

Below is a weight matrix of topics that will be researched and analyzed throughout the thesis research project.

Description	Research	Value Engineering	Constructability Review	Schedule Reduction	TOTAL
Structural			15	10	25
Conveying		10	10		20
Prefabrication	15			10	25
BIM	30				30
TOTAL	45%	10%	25%	20%	100%