TECHNICAL ASSIGNMENT #3

Alternative Methods and Research

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EXECUTIVE SUMMARY

Technical Assignment 3 looks at areas for research and possible improvement on the Aquarium Hilton Garden Inn project. Included in this technical assignment are Critical Industry Issues, Critical Issues Research Method, Problem Identification, and Technical Analysis Methods.

The Critical Industry Issues section include a summary of the PACE (Partnership for Achieving Construction Excellence) round table I attended at the Penn Stater Hotel and Conference Center on October 11-12, 2006. Topics covered at this roundtable included a session on MEP Systems as well as a session on Building Information Modeling (BIM). These discussions are on critical issues facing our industry and have helped to set a base for my critical issues research to be completed in the spring semester.

The Critical Issues Research section looks at further implementing BIM on the Aquarium Hilton Garden Project. I plan to see in what ways BIM can effectively be used to add value to the project. A BIM model has already been generated and there are ways it can be further taken advantaged of to help complete the project on in a more effective timely manner.

The Problem Identification and Technical Analysis Methods sections look at areas in the Aquarium Hilton Garden Inn project to analyze in the future. These areas include analyzing technical building systems and construction methods for value engineering, constructability review, and schedule reduction/acceleration.

CRITICAL INDUSTRY ISSUES

MEP SYSTEMS

The goal of this session was to get an idea of what some recent trends with MEP systems are being used in the industry and discuss what affect these trends have on a project. Many topics were brought up and discussed during this session and these are summarized below.

- Prefabricated systems are being used more often in construction projects.
    - Helps control field labor which can make or break a job.
    - Racking systems require more support for transportation many times requiring more support.
        - This makes the systems bigger forcing the ceilings to be lowered.
    - More communication is required with prefabricated systems to deal with
        - Transportation of the system
        - Getting system into the building
        - Final look of the system
    - Prefabricated systems require design of the structure to be finalized early so the prefabrication can start.
    - Can cause problems with Unions when system is prefabricated in one region/local and is shipped to another

- Labor saving materials and connectors are becoming more popular.
    - Track records are not present to assure that these materials/systems really work
    - Architects and Engineers often battle over the use of these labor saving materials/systems
    - For lighting products it is hard to stay up to date on all the new products because they are constantly updating
        - Example is new combo panel and transformer systems

- Many design decisions are now being based on energy cost and risk of future money spent.
    - Energy upgrades on existing buildings with year end excess money is becoming very popular.
    - Energy saving decisions goes to the C.F.O/C.E.O.
    - Allows L.C.C analysis to be considered.
    - Up-front capital financing by building is starting to become prevalent.
    - Guaranteed energy savings market is rapidly growing.
    - Many owners are now renovating older buildings to help them perform better.

- Many design decisions are now being based on energy cost and risk of future money spent.
    - There is a LEED push in design and ASHRAE Design Standards
    - Outdoor air quantity is based more on building materials and occupancy
    - Research is being done to see how cost in performance and cost in providing more outdoor air weigh against each other.
    - Heat recovery is becoming a bigger and bigger issue.
    - Green decisions need to start during the design/concept phases of construction as appose to starting later in the project.
        - This will help save owners money

- Advancements are constantly being made and consultants are behind the curve in learning the new technology.
    - Consultants need to be under the architect instead of the owner to make it easier to implement new more technically advanced systems.
    - There needs to be some standardization of products/infrastructure for MEP/Designers.
    - Selection of materials needs to come early in the project to alleviate pressure of fitting new systems into small rooms.

- More flexible systems are being used to allow for future changes in the building by the owner.
    - Under floor air distribution systems are becoming more prevalent.
        - Exposure to weather with the ductwork because the enclosure of the systems is slow.
    - When changing to a new system it takes a change in mindset by the whole team.
    - New systems require:
        - More integration
        - Different sequencing
        - More detailing

- There is a disconnect between the real world and the theoretical world in MEP Controls.
    - Simulation tools are being used.
        - Owner needs to give inputs on how the building will be used and operated.
        - Use databases and energy use in existing buildings
    - Owners and Developers need to have and understand an energy budget when constructing a building.

TEAM DYNAMICS AND COMMUNICATION WITH BIM

This session was used to discuss BIM modeling and how it can help with team dynamics and communication on a project. The problem with this discussion was that very few people in the room had any experience with BIM. The session ended up basically being a discussion on why it wouldn't work. Many questions arose throughout the discussion including.

- Who would/should be responsible for the BIM?
- How does it get updated daily as the project changes?
- How do we combine models made by different contractors on different programs?
- Does it really add value to a project?
- What uses can it have on a project?
- How does the owner get convinced to pay for it?
- How does the project delivery affect the use of the model?
- Can it help with phasing of projects?
- How much does a model cost for a typical project?
- How hard is it to view the use/view the model?
- How do we start implementing BIM on projects?
- How does the use of BIM shift liability to the creator of the model?

The overall tone of the session was one of doubt. The industry members did not know enough about BIM to have a optimistic outlook on it. In order for BIM to become successful the industry has to become more knowledgeable on the subject. Success stories need to continue to be published showing how much money was saved and how much time was taken off the schedule by using BIM. The only company in the entire session who had experience with BIM was Southland Industries. The general contractors seemed to look negatively on the us the BIM.

CRITICAL ISSUES RESEARCH METHOD

From the PACE roundtable I was able to see how implanting BIM on a project was a huge task for many contractors. I understand many of the benefits of BIM and would like to be able to communicate these benefits to the industry members. I feel the best way to communicate these benefits is to show examples of how it has effectively been used on past projects and show how it could positively affect current projects. By showing these success stories hopefully members of the industry will buy into the fact that the BIM model is worth the time and money it cost to be developed and maintained.

For this I would like to take the BIM model Holder Construction Company has developed for the Aquarium Hilton Garden Inn project and use to further communicate the benefits of BIM to the industry. With the model I would be able to show the different uses of the model and get real world. The main tasks I would like to do include:

- Showing a comparison of takeoffs between a BIM and traditional plans and the time associated with each.
- Show how it can be used by a Superintendent to communicate with the subcontractors in meetings.
- Save time in the construction process by using collision detection catching collisions early to keep delays from happening.

Through these task I can show how affective a BIM model can be and give an idea of the value it brings to a project.

PROBLEM IDENTIFICATION

VALUE ENGINEERING

- Use of a precast stone panel instead of man-laid stone system
- Use of a central heating/cooling system instead of the each guest room having an individual unit.
- Change EIFS system to an alternate system to help avoid leakage/mold problems in the future.
- Alternate lighting system in the rooftop bar to help make it stand out.

CONSTRUCTABILITY REVIEW

- The building envelope involves EIFS, stone, aluminum panels, plaster, curtain wall, storefront and windows. These are a lot of different façade systems to join together. Find a way to manage the building envelope system in the best manner to avoid leaks where all the different façade types come together.
- Alternate placement of building to avoid excavation and foundation at 3 different levels.
- Analysis of ways to utilize the small/congested site to its maximum capabilities.
- Minimize the number of different sizes of columns and beams used in the building. Standardize the column and beam sizes.
- Analysis of alternate types excavation support

SCHEDULE REDUCTION

- Alternate foundation system such as a mat foundation to speed up the schedule.
- Implementation of a SIPS schedule to increase productivity of mostly repetitive floors and bays in the building.

- Design build contract vs. GMP (CM at Risk) delivery method
- Alternate Roofing system – current system takes 2 months when the total project schedule is only 19 months
- Utilization of more precast member instead of all cast in place members. These members can come to site already cured and ready to place.
- Help design team keep complete design of structural and MEP systems faster to avoid delay in construction of structure and delay in delivery of MEP equipment.

Analyze cost of working overtime to finish project earlier vs. money the hotel would earn for opening earlier.

TECHNICAL ANALYSIS METHODS

The overall goal of the analyses is to reduce the schedule time to complete the project. I would like to be able to compare the cost of schedule acceleration techniques with the profit the owner receives by opening the hotel earlier.

ANALYSIS 1: Façade Investigation

The goal of this analysis is to find the best way to manage the many different types of facades on the building to help avoid leaks at the joints. This may involve having less variations of façade types in the building or just fining alternate types to help the building seal better. The alternate systems found should perform as well or even better mechanically to help with heat loss in the building. By changing the façade system I hope to be able to add value to the building through value engineering, schedule reduction, constructability issues as well as make the building more energy friendly.

ANALYSIS 2: Excavation/Foundation Investigation

The goal of this analysis is to help get the building up out of the ground faster. I will do this by analyzing the excavation schedule/design, the excavation support system and the type of foundation used to support the building. I hope to find alternative means for these areas to help the building get out of the ground faster helping to expedite the construction schedule.

ANALYSIS 3: Structural System Analysis

The goal of this analysis is to speed up the schedule through the use of precast structural members as oppose to the all cast in place structure. Through the use of precast members the structure can be erected faster allowing construction to move on to the façade and interiors work faster. The cost added for these precast members would then be compared to the profit the owner earns by being able to open the hotel sooner.

WEIGHT MATRIX

The following is a breakdown of how I believe my time will be spent completing these the research and analysis's above.

Description	Research	Value Eng.	Const. Rev	Schedule. Red.	TOTAL
Façade	5	5	5	10	25
Excavation/Foundation	5		5	10	20
Structural System	5		5	15	25
BIM	20		5	5	30
TOTAL	35	5	20	40	100

Please note the Critical Issue Research and the Technical Analysis need and will be further developed by the end of the semester.