Tech Assignment #3

"Alternative Methods and Research"

Widener University, New Residence Hall

11/21/2005

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Executive Summary:

In order to prepare for the research proposal at the end of the semester, this assignment required us to give information about the topic we were thinking about researching. For me this meant giving some background about why performing a constructability analysis has become more important recently. I also outlined some of my expected sources for gaining data on this topic.

The next section covers problems identified on the project and the analysis that could be performed into methods that would reduce these problems. For my building the problems identified were uncoordinated drawings, LEED™ points missed, and a very tight schedule.

The last section is the expected weighting of the final project. This is how I expect my effort to be distributed and how I expect my grades to be weighted during thesis next semester.

Critical Issues Research Method:

The major research issue of this thesis is the benefits of conducting a 3rd party review of design documents prior to construction. Many general contractors and construction managers are complaining of a recent decline in quality and detail of drawings produced by architects and engineers. This problem seems to be due to a shortening of the time allotted for design and owners not wanting to pay for design services. This shortening of the design process creates rushed designs that often have more mistakes than a set of contract documents should have. Each of these mistakes is likely to produce a change order later in the project. This leads to cost escalation and occasionally a lengthened schedule. This research will compare the number of change orders on projects that have conducted peer reviews and the average total cost of change orders on these projects compared to projects that have not conducted third part reviews.

The best places to look for this information is from companies that regularly perform this service or owners who have chosen to require a 3rd party review. It seems reasonable to assume that this information would be a part of the marketing information used by a construction company to advertise their services to prospective clients and by owners as justification for requiring the review.

I have discussed the possibility of gaining data for my research from three companies that were at the career fair. The first company, The Foreman Group, seemed very open to providing data for me to analyze. Third party reviews are a major part of their operation. They almost always are able to save owners more than their fee by catching design errors before the construction of the building is underway. The second company I talked to, SGH, did not seem to keep track of the data in a way that I could use. This was because, as a design company, if they caught a mistake they just fixed it, they did not keep track of the number of mistakes that they found. The last company I talked to, Turner Construction, said that they did several different types of 3rd party reviews. They reviewed schedules, estimates, and performed constructability reviews. However, from our discussion they do not seem to keep records in a way that I will be able to analyze. They did offer to give me the contact information of two of the owners who they provided with constructability reviews.

Although not all of the people I talked to will be able to directly provide data for my research, they all seemed very interested in seeing the results when I am finished. This level of interest should indicate a good chance of participation by any other companies that may have data that I could use.

Problem Identification: (Advisor Comments in Italics)

Some of the problems encountered on the Widener University, New Residence Hall included:

1. Chases designed smaller than duct that needed to go through them.
   The mechanical chases for the building were nearly all designed with a width of 10". The smallest ductwork in the building was 10" wide, this does not include flanges at connections. The chases also did not include room for pipes. In the design, these were to be core drilled next to the chase opening. This just doesn't make any sense.

Item 1: I'm not sure about the solution to this problem, other than increase the size of the chase. Can you redesign something to allow for more access, etc.? This could be a challenge to make it a significant area for investigation.

My intentions with this subject were to find the size that the chases needed to be to accommodate both the duct and the piping shown next to them and possibly compare the cost and delay of catching this design mistake during submittals rather than in the field. This would tie in nicely with my research topic.

2. Although LEED™ sustainable concepts were included in the design, there was no effort to become LEED™ rated. Items such as geothermal heat pumps and power saving lighting are used throughout the building. It seems like they may have been able to gain LEED™ rating without a very substantial cost.

Item 2: Could be a good area for investigation. Perform a preliminary analysis to see if the basic requirements are met for LEED certification. This is easy and can help identify other interesting opportunities for attaining additional LEED points. These other areas can then be helpful to identify additional investigation areas.

Ok, preliminary analysis will be completed for the proposal.

3. The building has a very tight schedule. However, they used masonry load bearing walls with precast plank flooring. It seems that there would be better systems for a tight schedule project. I don't know if this system was chosen for cost or for other reasons.

Item 3: Could be a good investigation area. I would guess that the system is selected based on cost since it is a low cost system. If schedule is important to the owner, then investigating other systems, e.g., all precast similar to the MGM Hotel, would be valuable. Can also provide a good area for structural breadth.

I had assumed that some structural sizing of the chosen system would be required in this area. Precast is one of the systems that would be compared. I also wanted to look at the schedule difference of using steel for this building. Along with this topic, I will probably look at the cost of schedule acceleration during construction for the systems considered.

Please add some additional detail to these for your Tech 3 and possibly identify another area instead of Item 1 unless there is something that is more indepth in this area.

4. Alternate to Item 1- Use 4D CAD to create a better visualization of construction of the building.

Technical Analysis Methods:

1. Value Engineering- Because of the importance of the green building movement on current and future buildings. I would like to look at where this building falls on the LEED™ point system. There are several sustainable features to the building and although the building is not LEED™ rated, I think it would be interesting to see how much more effort and cost would have been required to have the building certified.
2. Constructability Review- Before construction on the project started, the Senior Project Manager realized that the coordinating architects were not properly reviewing the plans of the engineering designers working under them. His response to this was to check all coordination between drawings. During this process he found that none of the chases were sized large enough to hold the ductwork that needed to fit inside of them. I think it would be interesting to see how much money was saved by catching this and making the changes through shop drawings rather than having to cut the precast concrete at each floor later.
3. Schedule Reduction- The schedule on this project is very critical because the building must be occupied in time for the fall 2006 school semester. The project start was constrained because the school did not want construction to start until after the spring 2005 semester. This provided a window of May 2005 to August 2006 to deliver the project in. If the project would fall behind schedule due to bad weather or another unforeseen delay, the usual methods of increased staffing, overtime, or extra shifts may be needed. The method used and the cost of implementing the method would vary depending on the amount of time that needs to be made up and the activities that are under construction at that time.

Description	Critical Issues Research	Value Engineering Analysis	Constructability Review	Schedule Reduction/Acceleration	Total
4D CAD Analysis	5		10	15	30
Gaining LEED Points		10	15		25
Structural System Change		5		10	15
Issues Research	25		5		30
Total	30	15	30	25	100