

Loyola/Notre Dame Library

Baltimore, MD

Technical Report 3:
Alternative Methods and Research

Sandra M. DiRupo

Construction Management

Dr. Michael J. Horman

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Executive Summary

In Technical Report 3, critical industry issues taken from PACE Roundtable discussion, research methods of critical construction issues, technical problem analysis methods were laid out for my final thesis proposal due on Friday, Dec. 14, 2007.

A summary has been concluded for PACE Roundtable discussions. Critical research will be conducted by evaluating sustainable design in building renovations, and I hope to incorporate this in my proposed thesis Analysis 3 as well.

As of now, no key findings regarding my thesis analyses were discovered. I have some ideas that have not been proved feasible just yet, but they are good ideas that are awaiting approval from my Architectural Engineering professors and peers. For right now, I have some basic ideas, and I have created a weight matrix that distributes my effort among the three proposed analyses, (1) Prefabrication, (2) Alternate Schedule Patterns, and (3) Life Cycle Cost Comparisons.

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A. Critical Industry Issues: PACE Roundtable Discussion

Prefabrication



Prefabrication can be both cost and time efficient in the AEC industry according to Stan Carley (Hensel Phelps), Michael Miller (Southland Industries), Charlie Yedder (Developer), and Michael Horman (Professor). Prefabricated materials can be assembled off site, which can save a lot of time and labor costs. In extreme cases when deadlines are quickly approaching, prefabricated materials should definitely be considered. Below are some advantages and disadvantages of prefabrication in the construction industry according to owners, architects, engineers, and general contractors:

Prefabrication Advantages	Prefabrication Disadvantages
<ul style="list-style-type: none"> Reduction in labor costs 	<ul style="list-style-type: none"> Prefabrication limits custom made design (architects do not like)
<ul style="list-style-type: none"> Benefits Green Building Initiatives: enhanced efficiency & better quality (operates the way it was designed) 	<ul style="list-style-type: none"> Needs to be implemented in design early on, otherwise, will probably not happen
<ul style="list-style-type: none"> Buildings are typical and easier to build. 	<ul style="list-style-type: none"> Difficult to coordinate trades in field or off site
<ul style="list-style-type: none"> Eliminates waste (ex: precast) 	<ul style="list-style-type: none"> Transportation and code issues
<ul style="list-style-type: none"> Owner, architect, engineers, and CM all work together and coordinate early on. 	<ul style="list-style-type: none"> Designers not inclined to think about these issues
<ul style="list-style-type: none"> Save TIME and MONEY 	<ul style="list-style-type: none"> Not being coordinated to optimum capacity
<ul style="list-style-type: none"> Schedule reduction 	<ul style="list-style-type: none"> Need to coordinate with BIM for complex buildings (subs do not like this typically)

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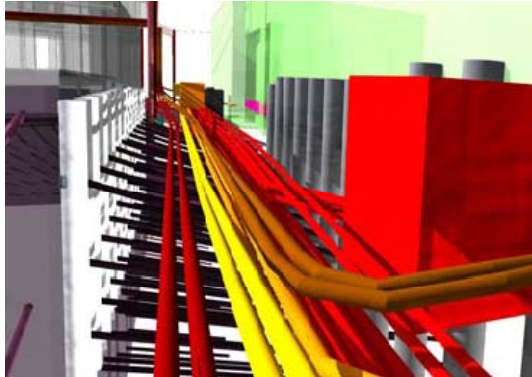
Sandra DiRupo

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Building Information Modeling



Building Information Modeling is a wonderful new development in the AEC Industry, however; many industry professionals are not able to effectively implement the technology when coordinating with subcontractors. This is a major drawback for using BIM for many companies. Below are some advantages and disadvantages of BIM according to John Messner (Professor of Architectural Engineering) and industry professionals from SKANSKA and Jacobs Facilities:

BIM Advantages	BIM Disadvantages
<ul style="list-style-type: none">• Limits lagging in design if used from day one	<ul style="list-style-type: none">• Owner does not require BIM, this is a huge barrier
<ul style="list-style-type: none">• More easily measure design and efficiency	<ul style="list-style-type: none">• Likely to cut down on potential change orders and more easily solve coordination problems
<ul style="list-style-type: none">• If used correctly, BIM is an excellent tool	<ul style="list-style-type: none">• Training BIM to subcontractors that are unwilling to learn
<ul style="list-style-type: none">• More easily visualize a building through modeling	<ul style="list-style-type: none">• BIM must be implemented early on in design phase so subs are prepared.
<ul style="list-style-type: none">• Solve coordination problems before they occur.	<ul style="list-style-type: none">• There is a lack of skill set in the community. Cannot be set up wrong in the beginning.
<ul style="list-style-type: none">• BIM's can be used for facilities management	<ul style="list-style-type: none">• Using BIM creates a cultural barrier among companies that are willing to learn it and those who want nothing to do with it.
<ul style="list-style-type: none">• Owners are willing to pay more if pre-qualified subs are involved early on.	<ul style="list-style-type: none">• Some people do not have the correct understanding of what BIM is and what all it can do; design, coordination, scheduling, estimating, facilities management.

Labor Management



The last PACE discussion of the day was lead by Dr. Riley (Professor of Architectural Engineering) and industry professionals from Southland Industries and Balfour Beatty Construction. The labor force is an area that the construction industry should be supporting more since there is so much work in construction these days. There is a high demand for both management and labors alike, so more needs to be done to try to recruit students graduating from high school to either join the labor union or go to a trade school. Right now, many people do not realize that there is plenty of good work to get involved with in the construction industry. Some of the best superintendents are not college educated, but are more than capable of supervising construction.

The labor union is a great program for anyone who does not plan on going to college because there are wonderful benefits and competitive wages. College is not for everyone, but there are good jobs out there in construction and other trades. High schools seem to promote college and technical schools; however, joining the labor force is also a great way for young men and women to get involved with construction. It is actually a very rewarding profession that goes unmentioned. Industry is trying to take initiative to involve more young people to get involved in the labor union. It may take a while before this trend is set though.

Surprising Discussion

I was surprised about the labor management discussion. I cannot believe that there are such good jobs out there for young high school graduates to become involved in, but the industry for some reason is under-represented and looked down upon. It frustrates me because I would join the labor force if not given the opportunity to go to college. The wages are great and so are the benefits!

Issues Affecting MY Thesis

I think that BIM was a great discussion, and I would love to use it in my thesis, if I can tie it in with my theme. I am not too great with building CAD models though, so this may hinder my BIM efforts. I also like the idea of prefabrication solutions for schedule condensing purposes. I am going to try to incorporate a prefabricated curtain wall system into my thesis if it works out. I definitely got some useful tips from that discussion.

Key Contacts

Honestly, I found it very difficult to converse with industry professionals at this event because there were so many people in a given room at one time. I met a few people, but smaller focus groups would have been more effective in my opinion. I met people, but I am not necessarily sure if they would be able to be of assistance with my thesis ideas. I am sure that any one of the experienced professionals that I met could help me though, especially with scheduling and cost saving methods.

James Faust, Turner Construction-Has over 30 years of construction experience

Michael Miller, Southland Industries-Prefabrication

Ted Border, Whiting-Turner-Prefabrication

B. Critical Issues Research Method

“Incorporating Sustainable Design and Construction Methods for Building Renovations”

The demand for building efficiency will continue to rise, since energy conservation will be implemented on a global scale in upcoming years. Energy conservation, in particular, is a problem that designers and contractors are going to have to work together on in order to keep life cycle building costs down. More and more owners are willing to pay higher costs for energy efficient buildings that will require less maintenance.

The goal of this research is...

- To determine why building owners are so concerned with sustainable applications for their building renovations
- Compare energy efficient solutions for existing systems compared to new sustainable systems
- Compare statistics for different building renovations

Building owners, contractors, and designers may all benefit from this research since LEED buildings are becoming so popular. Eventually, LEED may even be a requirement for all new buildings and renovations. Owners will obviously benefit since LEED buildings are meant to save money on life cycle and maintenance costs. Renovations are able to be LEED certified as well, but sometimes renovations are already complex and expensive, so sustainable solutions get neglected more often.

To further research this topic, I plan to do a literature review, using the university library databases offered to PSU students, to prove the importance of incorporating sustainable designs in building renovations. Talking to building owners, developers, and owner's representatives will also be helpful after I have done my research. Some owners are educated, and do realize that sustainability is the way of the future. For those owners that are not too familiar with LEED, I may be able to educate them somewhat after I have done some research. I also plan to conduct interview format questions for industry professionals to get some input on different sustainable solutions.

C. Problem Identification

Problematic Features

- Schedule Issues: Curtain Wall Construction
- Construction Zones Separated by Occupied Zone
- Lack of Energy Efficient Efforts

Curtain Wall Construction: The scheduled time for curtain wall completion was longer than expected. This was partially due to the long lead time on some of the glass panels. Some of the decorative fritted glass had a delayed installation due to manufacturer issues out of the contractor's hands, but it was nearly impossible to speed up this process. Once the glass did arrive, it created conflict with site work because the two subcontractors crossed paths. Grading and paving had to be negotiated within the schedule because of this causing some delays.

Construction and Occupied Zones: One of the more difficult tasks to manage when dealing with renovations is having building occupants in a building that has areas under construction, which was the case for Loyola/Notre Dame Library. Libraries are supposed to be a quiet learning environment, so this made the task even more challenging. Everyone on board did all that they could do to make this process run smoothly, but there were still some other issues to be considered: bathrooms on each floor had to remain open and meet ADA requirements (with the exception of the floor under construction), library supply storage space, parking, safety of building occupants, and extra costs to implement safety.

Lack of Energy Efficient Efforts: Since one of the libraries main concerns for the new facility is that it would be an energy efficient building that would ultimately save some money in life cycle cost, it was surprising to see that there were not more sustainable efforts to try and make this happen. For example, light fixtures were replaced on each of the existing floors, but some of the mass quantity fixtures were not of the highest quality in the sense of energy conservation. Also, the cooling tower is to remain, while other mechanical features such as AHU's and ductwork will be replaced and/or added. There may have been more economical ways to go about staying away from maintenance costs of the existing cooling tower, but for the owner, a new cooling tower would be one less first cost item to worry about.

D. Technical Analysis Methods

Analysis 1

Save Time on Curtain Wall Construction → Prefabrication

If long lead times could be avoided, every construction project would run smoothly. Unfortunately, almost every construction project has long lead time items, so I intend to research ways to incorporate prefabricated sections for the curtain wall. By doing so I hope to find that labor costs may go down in addition to keeping this task on schedule or ahead of schedule. I will conduct a detailed cost comparison for curtain wall construction. I already did an assemblies estimate for the curtain wall in Technical Report 2, so I already have a start on typical assembly costs. If the contracted subcontractor, Spear Window & Glass, cannot provide a prefabricated system, then I will contact other manufacturers that offer prefabrication in this area. I hope to prove that labor costs will go down, schedule will be condensed, and curtain wall construction efficiency will be accomplished in relation to its following tasks, such as site furnishings and landscaping.

Analysis 2

Construction and Occupied Zones → Alternate Schedule Patterns

In order to prevent conflicts that resulted among building occupants and construction processes, I am going to research ways to adjust the schedule so that such conflicts may be avoided. One conflict was that restrooms were to remain open on each floor while one floor was under construction. With the way that the schedule was set up, this caused some ruckus on the existing floors that were not yet under construction, but had bathroom construction going on in occupied spaces. This caused some disturbances that may have been avoided if each floor would have been construction free while one floor at a time was completely under construction. This would have allowed for faster floor completion, opening up the schedule for existing phase II activities to get completed. I would like to propose a different phasing plan because I feel that there would be better solutions to eliminate library disturbances while completing crucial tasks by the necessary deadlines.

Analysis 3

Lack of Energy Efficient Efforts → Life Cycle Cost Comparisons

I think that a good way to implement sustainable design into this renovation project would be to propose the purchase of a new cooling tower, rather than keeping the existing cooling tower. This would eliminate maintenance costs down the road and most likely keep life cycle cost down, according to an engineer from James Posey Associates. Specifically, a variable frequency drive may reduce life cycle costs compared to the original cooling tower. I plan to do a life cycle cost analysis for this. If I can use computer software to back up my calculations, that would also be helpful. I would like to prove to owners that, even though first costs of sustainable building systems may be more than their budget allows at the time, but over a long period of time, money may be saved. Hence, I will conduct a life cycle cost comparison for both cooling towers.

E. Weight Matrix

Description	Research	Value Engineering	Constructability Review	Schedule Reductions	Total
Analysis 1	X	X	10%	10%	20%
Analysis 2	10%	X	20%	10%	40%
Analysis 3	10%	30%	X	X	40%
Total	20%	30%	30%	20%	100%

I have not conducted a lot of research just yet, so I do not know which information will be easier for me to obtain from each analysis. Analysis 2 and 3 are weighted the same right now, but they are subject to change if more information is found in prefabrication findings for Analysis 1. This will be finalized in my proposal at the end of the semester.