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TECHNICAL ASSIGNMENT #3

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EXECUTIVE SUMMARY

In Technical Assignment 3 you will find discussion on both problems that plague the industry as well as technical problems that are involved with the Warrenton Aquatic and Recreation Center. The following breakdown into individual sections is used for organizational purposes: Critical Industry Issues, Critical Issue Research Method, Problem Identification, and Technical Analysis Methods.

The critical industry issues section is based off of discussion at the PACE roundtable. This paper highlights the following three sessions: Building Systems Challenges (Mechanical and Electrical Systems), Building Information Technology Modeling (Education and Workforce Issues with BIM), and Building Respect (with Design Professionals).

The next section of the paper identifies the critical industry issue that I will research (Ethics) and the details of how that research will be conducted. To further elaborate, I will send out a detailed survey to industry members about ethics and corporate policy towards ethics to create a tool that can be used by construction companies to help implement ethical practices. A sample of the survey questions has also been provided for reference.

The problem identification portion of Technical Assignment 3 lists problems that I have identified that will reduce schedule and cost as well as ease constructability. The problems identified are Precast Brick Panels, Single Structural Framing System, and Victaulic Pool Plumbing.

The last portion of the paper is the technical analysis methods for the aforementioned problems that were identified. This section will describe how I will complete the research and analysis of the different building systems as well as what types of design and construction analysis that I will perform. Also included in this section is a weighted matrix that will show how I will divide my time for the given issues.

CRITICAL INDUSTRY ISSUES

At the PACE roundtable, many key industry issues were discussed in depth by industry members, faculty, and students. This paper will summarize the results of the sessions I attended as well as discuss how the seminar pertains to my project.

SESSION I: BUILDING SYSTEMS CHALLENGES **1B-MECHANICAL AND ELECTRICAL BUILDING SYSTEMS**

To summarize the session, we talked about industry trends and how to deal with problems that are arising from them, different types of research areas in the MEP field and the industries outlook on simulation tools. The results of the discussion are as follows:

There are four different trends that we hit on but the main trend for MEP systems by far and away is the use of prefabricated systems, which is the result of new materials and systems that have been developed (Victaulic & crimp vs. welding). Prefabrication allows for assembly and layout in controlled environments. This increases worker productivity and decreases field labor risk with regards to safety during installation. The group cited LEED & Green as drivers for prefab which is making the systems better and cheaper. Another trend that the group discussed briefly was underground air distribution for cooling and heating, but most felt that this technology causes problems, especially with air escaping into other spaces. Pro-Press copper jointing is also being used for labor saving reasons, but the industry members suggest keeping this type of system concealed because it is hard to keep in a straight line when installing. Also it was pointed out that this type of system is good for renovations because of no flames or burning during installation. The last trend discussed is owners wanting heat recovery units because they are making decisions based on future energy costs. However, when projects are running over budget, these units are one of the first things to get cut out. The group decided that if heat recovery units are thought about up front and that green is incorporated properly, the units can be downsized and save energy and money in the long run.

The problems that arise with these trends are few so far. Prefabricated pipe systems require architectural consideration and space to be used, which can cause many coordination problems. Prefab also presents a challenge with regards to its racking

systems. These are often big and bulky for rigging and transportation purposes, and thus are unaccounted for in shop drawings, so again coordination issues result. The other problem with the current trends that the room identified dealt with specialty consultants such as telecommunications and AV. Most in the room felt that these trades are behind the curve on almost all projects and that they should be brought on board earlier to help resolve their issues earlier, which will save on cost.

As far as research areas and simulation tools for the industry, a few ideas were brought to attention. Most ideas however focused on the research of integration of technology into the industry such as simulation tools. The industry members were concerned with how they could train their employees, if the tools could add value to the projects, and if elements of the programs could be standardized for use among different software. The industry said they would look to college grads for knowledge of simulation tools and to use their knowledge to help develop their companies programs. The last issue discussed by the industry members was that simulation tools are great in theory, but are based on assumed variables. Once the variables change however, the model can change drastically. Also, the use of variables among different companies are often not coordinated, so what one company is using for a simulation is not necessarily the same as the other, which can result in simulations being far off.

SESSION II: BUILDING INFORMATION MODELING TECH. **2B-EDUCATION AND WORKFORCE ISSUES FOR BIM**

The session on BIM was a lot less in depth because of the knowledge of the subject among industry members and students. Upon entering the discussion, fewer than 25% of the people even knew what BIM was, let alone how it could help the construction industry. The industry members said that they would again rely on graduates to bring the technology into their company. When asked whether they would hire based on this skill, all of the members said that they would look at it as an added bonus for candidates.

The next issue discussed about BIM was how it adds value to a project. The industry members felt that it helped give a competitive edge during presentations with potential clients, but with regards to scheduling, pre-con, and construction, they felt that people can already do these tasks without BIM. On the other hand, most students felt that

it was an easier way to visualize and plan out the project more effectively as well as to help resolve coordination issues early in a project.

The last topic to discuss is the outsourcing of modeling. Most said that if they felt BIM was necessary for a project, they would outsource because it only happens once a year or so. They all predicted that in ten years they would probably have BIM within their company and would not need to outsource, but for the time being there is not enough demand to have someone or a group within their own company creating BIM's.

SESSION III: BUILDING RESPECT... **3B-WITH DESIGN PROFESSIONALS**

Respect when it comes to design professionals in the industry is always a touchy issue. The group highlighted a few key areas to show respect for design professionals, with the most important one being friendly and personal. Ideas such as making phone calls instead of just sending emails and faxes for RFI's, taking time to learn a little about the others personal life such as interests and family, and offering solutions to problems were all mentioned as ways to gain credibility and respect. It was talked about and is fairly obvious that when design professionals and the GC or CM are getting along, the project runs a lot smoother and is considered a lot more successful.

The last area discussed was how we lose the respect design professionals as an industry. Most felt that it starts at the collegiate level, and can even be seen now with structural and MEP students saying that CM's are taking the easy way out. But when we discuss our problems and relate them to their problems they realize how hard our field can be. Also noted in the discussion were things not to say such as your drawings are worthless and things of that nature.

PERSONAL THOUGHTS AND COMMENTS

The major surprise that I had in the different sessions of the roundtable conference was how even though most people in the rooms were competitors, they still exchanged ideas on how to solve critical problems and offered valuable information to each other. I did not expect this type of relationship among industry members because I would think that they would use their knowledge in different areas as an advantage over

their respective competitors. It was very nice to see this type of relationship. The other surprise I had was how well the industry members related to the students. It seemed that even though we were not on the same level knowledge-wise, they respected our opinions and took them into consideration when discussing the issues at hand.

As far as the Warrenton Aquatic and Recreation Facility goes, the issues that would affect this project by far and away would be the prefabrication of plumbing and pool systems. Because there is a large amount of pipes in the building, the cost and time savings associated with the prefab would be significant. I also think that the issues discussed in the start-up, operations and maintenance session will be of high value to me because of the amount of different systems in the building.

Finally, through the roundtable I met a few individuals that offered help if I need it during my research or for any other questions that I may have. They are: Jim Faust from HSC Builders & Construction Managers, Bennie Kovach from Forrester Construction, and Mike Miller from Southland Industries. It is also important to thank Mike because he was also of particular help during the team building exercise as we each won a nice hat by building the largest tower.

CRITICAL INDUSTRY ISSUES

PROBLEM STATEMENT

Ethics in the construction industry is an issue that is never clear cut. What companies view as ethical differs greatly and can have a significant impact on their competitive advantage. As a result, the industry suffers from a poor image and an uneven playing field.

RESEARCH GOAL

The goal of this research is to define the major areas of ethical violations identified by construction companies to create a set of corporate strategies that will reduce ethical violations. The results of this research can be used as a resource and a guide for companies to use formulate and implement strategies to make their staff behave more ethically.

RESEARCH METHODOLOGY

1. Develop and distribute a survey for project managers and superintendents.
2. Tabulate the results based off of the surveys to define the top five unethical issues in the industry
3. Use corporate strategy matrices to define strategies to resolve ethical issues
4. Develop a decision guide for companies to use to create and implement strategies to increase staff ethics

SAMPLE DATA COLLECTION TOOL

The following table is a sample list of questions that will be used in the survey to define the industry identified ethical issues. The responses of this survey will then be tabulated accordingly to define the major ethical issues and will then be used in strategic matrices to define corporate strategies.

Ethics Survey					
Company Name:					
Position:					
Years of Experience:					
Companies Worked For:					
*The following surevey is completely confidential and is only being used for research purposes.					
Circle the Appropriate Weight					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
You encounter a problem you consider unethical in the field at least once a month	1	2	3	4	5
You encounter a problem you consider unethical in the field at least once a week	1	2	3	4	5
You encounter a problem you consider unethical in the field at least once a day	1	2	3	4	5
You front-end load the schedule	1	2	3	4	5
You consider front-end loading unethical	1	2	3	4	5
You participate in bid shopping	1	2	3	4	5
You consider bid shopping unethical	1	2	3	4	5
Your company has practiced improper or questinable bidding	1	2	3	4	5
You have participated in improper or questionable bidding	1	2	3	4	5
Your company has a value statement addressing ethics	1	2	3	4	5
Your company's value statement is easily identifiable and frequently addressed	1	2	3	4	5

PROBLEM IDENTIFICATION

The following items are different aspects of the Warrenton Aquatic and Recreation Center that could possibly be redesigned or handled differently to either make the cost less or reduce the schedule. These items will be assessed at a later date based on further research and solutions will be provided.

- I. Use precast brick panels for installation instead of Norman brick
 - Brick installation requires large amounts of scaffolding
 - Material storage around the site causes congestion
 - Increased number of personal causes congestion
 - Length of schedule is significantly increased compared to precast panels
- II. Maintain one type of structural framing system instead of using structural steel, concrete walls, and masonry bearing walls.
 - Different structural systems require increased number of trades on site
 - Slower rates of installation because of lack of learning curve
 - Coordination among the different structural trades and MEP trades
 - Contractual responsibility between different structural contractors may result in coverage disputes
- III. Standard pool piping is expensive and time consuming
 - Prefabricated systems reduce schedule significantly compared to standard piping
 - Standard pipe is expensive compared to Victaulic pipe
 - Safety issues are a concern because of welding

TECHNICAL ANALYSIS METHODS

The following is an analysis of the aforementioned technical problems with the Warrenton Aquatic and Recreation Center. It will include how the research will be conducted as well as the different types of construction and design analysis that will be performed.

PROBLEM I: Use precast brick panels instead of Norman brick

My research on precast vs. standard installation will focus on the schedule and cost reduction as well as compare quality. I will do a comparative analysis between the actual cost, schedule, and quality of the brick system and proposed precast system based on information from local subcontractors that perform the construction. I will use a

structural analysis as well a constructability review to address schedule, cost, and quality issues.

PROBLEM II: Single structural framing systems

A structural analysis will be performed for a proposed system that will eliminate the concrete walls of the structure in an attempt to reduce subcontractors on site and reduce coordination. An analysis comparing the original system to the proposed system will be conducted to analyze which system is better based on analysis of cost, schedule duration, and constructability. Local subcontractors will be contacted for the comparison of cost, duration, and constructability.

PROBLEM III: Victaulic Pool Plumbing

A comparative analysis of between the cost effectiveness/duration of installation of Victaulic piping to standard weld pipe will be conducted using the actual construction costs for the standard system compared to the proposed Victaulic system. Design analysis will be conducted for feasibility purposes. Piping contractors will then be contacted for cost and duration figures do complete the analysis. For constructability purposes I will compare the safety of each and required lay down and equipment resources necessary for the construction.

WEIGHT MATRIX

The following weight matrix is given to show how the distribution of my time will be performed based on the issues defined earlier.

Description	Research	Value Engineering	Const. Rev.	Sched. Red.	Total
Precast Brick Façade		10%	10%	5%	25%
Single Framing System		5%	15%	5%	25%
Victaulic Plumbing		15%	5%	5%	25%
Ethics Issues	25%				25%
Total	25%	25%	25%	25%	100%