Tech 3

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St. Elizabeth's New Psychiatric Hospital
2700 Martin Luther King Jr. Ave., SE
Washington, DC 20032

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I. Executive Summary

This document looks at the specific areas of interest that will be presented in the final proposal for my thesis research this spring. The particular sections contained within are Critical Industry Issues, Critical Issues Research Method, Problem Identification and Technical Analysis Methods.

The Critical Industry Issues section is a review of the annual PACE seminar, which was held on October, 24 this year. I revisited the issues discussed by each discussion panel and offered personal comments dealing with their respective topics. These topics were Prefabrication, BIM, and Workforce Development.

Workforce Development stuck a particular chord of interest as a Critical Issues Research topic. Having grown up in the trades, I decided to take a closer look at where the illustrious image of becoming a successful tradesman has gone. Resulting are my thoughts as to how I will develop a research method that will be fruitful in discovering the lack of youthful interest in construction.

The last two sections of this document contain project specific issues pertaining to the construction of the new St. Elizabeth's Hospital. The Problem Identification section is a listing of major design or construction items that are being considered for further analysis. The following section, Technical Analysis Methods, contains the three topics chosen for proposal and briefly explain how they will be researched using the core thesis investigation areas. The final piece of information found at the end of this document is a Weight Matrix. This tool describes how I have decided to allocate time to specific issues within each analysis area.

II. Critical Industry Issues

The annual PACE Roundtable, held this year on October 24, brought industry members together to discuss three topics that are currently perceived as critical issues. Different from the format of previous years, discussion panels were formed based on expertise. Comprised of both industry professionals and AE faculty, each panel discussed and fielded questions on prefabrication, BIM, and workforce development.

Panel Discussion I: Prefabrication

The benefits of prefabrication in construction are becoming increasingly noticeable in certain areas of the industry. As a result, a push is being made to explore the possibilities of increasing prefabrication production and to encourage widespread usage throughout the industry. The focus of the panel discussion was then mainly on the pros and cons of prefabrication and where it is an acceptable and realistic option on a project. Examples of both successful and non-successful applications of prefabrication were discussed and the factors such as quality, cost, and schedule that affected the outcome were brought to the table. The issue of reduced quality was a theme that carried its way though most of the discussion. The preconceived notion of "cookie cutter" applications brought individuals to question the possibility of building a relatively high quality product that still maintained a level of customization. The discussion then shifted to the cost savings that can be acquired through mass factory production and the potential on site schedule savings that result. A representative from Whiting Turner discussed a university dorm project with such time constraints that entire pods were prefabricated off site. He cited that without this type of production the project would have been an impossibility. The increased costs that were associated with this level of prefabrication were outweighed by the ability to complete the project within the extremely tight amount of budgeted time. He mentioned however, that construction of this type, would, with further research and refinement, have the potential to offer comparable S.F. prices. Personally, this was a fascinating piece of information that might majorly affect industry practices in the relatively near future.

Panel Discussion II: Building Information Modeling

BIM is becoming more and more focused on as a major tool in the future of construction. As computer modeling becomes increasingly refined its advantages are beginning to surface at a higher rate than ever. Marketing BIM by informing consumers of its benefits was a major topic of discussion. However, it was noticed that a common *definition* of what BIM actually represents, was the first hurdle to overcome. The perception of BIM being used solely as an MEP clash detection tool is a common industry misunderstanding. Material quantities, phasing issues, and schedule implications can all be deduced real time with BIM, and in order to obtain owner "buy in," it was agreed that a strong base of consumer knowledge about BIM's capabilities is desperately needed. Ultimately, it is only a matter of time before this program achieves widespread use in the industry. The benefits clearly outweigh the upfront costs to produce the model and as technology improves these costs will only decline with time. The real challenge comes with marketing BIM in such a way that the consumer perceives it as a project necessity rather than just an option.

Panel Discussion II: Workforce Development

Over the past few decades the industry has seen a steady decline in new tradesmen entering the construction arena. The allure of a career as a carpenter, plumber or any other tradesman has diminished dramatically as the information age has progressed. This has lead to an influx of the foreign labor force but, with this new mindset among young people, does anyone really mind? As a result, the perception of the industry as a whole was discussed and a question was posed. Do we accept that America has passed its final generation of plumbers, laborers and electricians and welcome the foreign labor as their indefinite replacement? Or do we re-examine industry perception and attempt to turn our children on to good old manual labor once again? What became extremely apparent to me during this discussion is that parents no longer support the thought of their children entering the trades. Personally, I was told my entire life to get good grades so I wouldn't be out in the cold like my father year to year. Honestly in this day and age, I plan to say the same to my son down the road. I believe the classes have begun to shift at a rate which will be unrecoverable if changes within the industry are not made. Or, is the next logical step to integrate five years of Spanish into the AE program?

III. Critical Issues Research Method

Problem Statement

The PACE roundtable attempted to address the current state of the construction industry with regards to its labor force. The discussion on Workforce Development brought up interesting points about the declining involvement of domestic workers. As a result, the workplace has been flooded by foreign help and language barriers are becoming problematic. Aside from this issues however, the industry deserves a thorough look into where the allure of being a tradesman was lost, and what can be done to restore it, if anything.

Research Goal

The past few generations have cultivated a negative perception of the construction industry and it is becoming more and more powerful in the eyes of the nations' youth. The desire to become a tradesman has dropped drastically and our industry is seeing the effects in a major way. My research goal for the next several months is to conduct an in depth look into the causes of this negative perception. I intend to determine whether or not there is a chance to reengage our youth into this industry, and if so, what are the necessary steps that need to be taken in order to succeed.

Research Steps

1. To begin, I need to gain a comprehensive understanding of the current state of the industry by looking at current employment information.
2. In order to get a hold on past employment trends in the industry, I need to compile data from previous years outlining where youths have been heading post high school.
3. I then intend on surveying the general public to get an idea of what common perception of the construction industry is.
4. Once I have a database of hard employment numbers, the next step is to communicate with contractors to see where they are commonly pulling their labor force from.

5. I would then interview industry members about what they feel the future looks like for the workforce and gain insight into what their thoughts are for change.
6. After gathering all of the fore mentioned information, I will then make deductions as to where the industry currently stands and what needs to be done to move it into the desired direction.

Sample Survey

1. What is your highest level of education?
2. Are you in the construction industry?
3. Is someone in your family in the construction industry?
4. If yes, are they happy with their current career?
5. What do you think the average yearly salary of a plumber is?
6. Would you recommend that your child pursue a career in the construction trades?
7. Would you approve of your son/daughter marring a person in a construction trade?

IV. Problem Identification

St. Elizabeth's Hospital is currently mid-way though the construction of the superstructure. In this section, certain areas that brought about difficulties for the design team and contractors will be identified and discussed. The final topics for analysis will then be selected from this list.

Site and Foundations:

- **Were Geopiers the best option for foundation support?**

  The site of the new St. Elizabeth's Hospital sits atop an old civil war land fill. As a result, very poor soil conditions we're discovered and the bearing capacity was insufficient. The design team decided to go with a soil reinforcement option (the geopier) that would bolster the bearing capacity of the soil. This process involved the drilling and re-compaction of over 170 15'-20' deep auger holes. Could this process have been avoided through the use of an alternative type of foundation system?

- **Jack and Bore Operation**

  An underground steam tunnel was discovered and it was decided that it could not be removed. Unfortunately, a utility main needed to pass through and it was decided in haste that a Jack and Bore method would be utilized. Perhaps another method could have been imparted in order to reduce the extremely large change order that resulted.

Superstructure:

- **Structural Steel Sequencing**

  The new hospital is designed as a load bearing masonry structure with an internal steel frame that supports SOMD for the first, second, and third floors as well as for the roof. The structural steel sequencing became extremely intricate when combined with the phased masonry schedule. The clash of steel and concrete not only created scheduling difficulties but spread crews thin because of the on-site welding demand created by both the metal deck and beam pocket connections. An

alternative interior support system, such as precast concrete, may have been a viable alternative, alleviating complicated sequencing which could in turn yield schedule savings. However, I believe an in depth look at redesigning the projects' phasing and crane usage would yield a significant schedule reduction.

- ***Green Roof***

  A non-inhabitable Green Roof was designed for a large portion of the hospital's roof. As a structure that pursued no LEED® rating or any other sustainability practices, was the green roof completely necessary? Research into the benefits of green roof construction would need to be conducted in order to compare the costs and schedule implications to traditional construction methods.

M.E.P.

- **Mechanical loads in connection with green roof**

  The benefits of a green roof directly correlate to a reduced heating/cooling load in a particular space. In the specific situation of removing the green roof from the building, the mechanical loads involved would have to be re-examined and designed accordingly. An in depth look at increased mechanical costs would have to be explored and compared to the structural savings incurred by reducing the roofs load.

- **RMB Power Re-Route**

  In order to lessen the period of time before the campus can receive permanent power from the district, a power re-route was discussed. This would require the redesign of the existing RMB building on campus to accommodate the new hospital power supply.

V. Technical Analysis Methods

From the items discussed above, three are being selected for in depth analysis. This analysis looks at three core areas of investigation, namely, value engineering, constructability, and schedule reduction. Listed below are the three topics and a small discussion concerning each area of investigation.

- **Analysis I:** *Alternative Foundation System*
  - **Value Engineering**

    An in-depth look into an alternative foundation system may yield savings while maintaining the same/increased level of functionality and quality.
  - **Constructability Review**

    The Geopier system required an enormous amount of coordination with underground utilities. There was a specific area of non-disturbance surrounding each pier which inevitably required that most utilities be installed prior to drilling specific piers. In turn, this created another issue of accidentally damaging the newly installed utilities while drilling in close proximity. An alternative foundation system or soil stiffening method might alleviate these issues.
  - **Schedule Reduction**

    Although the Geopier system is relatively quick to install depending on depth requirements, research will be conducted regarding the schedule impacts of other systems.

- **Analysis II:** *Removal of Green Roof*
  - **Value Engineering**

    Replacing the green roof with a more conventional design could have produced significant cost savings stemming from reduced roof loads and alternative material usage. However, this balance has to be closely tracked with the possibility of an increased mechanical load.

- **Constructability Review**

  The green roof almost seems like an afterthought to the design. Consequently, it adds unnecessary complexity to the roof construction where as more conventional methods found elsewhere on the building would be just as sufficient.

- **Schedule Reduction**

  Using more common roofing techniques found elsewhere on the building will keep differing materials to a minimum and help the learning curve to continue climbing rather than be reset.

- **Analysis III:** *Re-sequencing of Steel Erection*
  - **Value Engineering**

    Although the cost implications of possibly bringing on an additional crane would be significant, the schedule savings would be proportional and possibly more valuable.

  - **Constructability Review**

    The intricacy of the 38 separate steel erection sequences posed coordination problems with masonry production. If either trade strayed slightly from the strictly prescribed sequencing and phasing schedules, there were direct schedule impacts due to either party not being able to perform work.

  - **Schedule Reduction**

    The addition of a second crane and the re-sequencing of both trades would prove to be extremely beneficial to cutting critical path schedule time.

VI. Weight Matrix

Description	Reserch	Value Eng.	Const. Rev.	Sched. Red.	Total %
Industry Perception	25				25
Alternative Foundation		5	10	5	25
Removal of Green Roof		10	10	5	25
Steel Sequencing			5	20	25
Total %	25	15	25	30	**100%**