Thad Maugle **Civista Medical Center**
Dr. Horman **Construction Management**

Tech. Assignment #3: Alternative Methods and Research

Table of Contents

Executive Summary

Technical Assignment #3 is intended to identify areas of the project that are good candidates for research in alternative methods of construction, value engineering applications, and schedule compression techniques. The following document consists of Critical Industry Issues, Critical Issues Research Method, Problem Identification, and Technical Analysis Methods sections. It is a preliminary look into issues that I will be researching for my Thesis Proposal. From this, the audience will better understand the background of my proposal and the methods used to research and analyze issues.

The Critical Industry Issues section summarizes the knowledge I gained from attending the Partnership for Achieving Construction Excellence (PACE) Roundtable Meeting in October 2006. PACE is a collaborative organization of industry members, engineering students, and faculty who work together to achieve excellence by sharing experiences and innovative ideas. The meeting was organized into three breakout sessions. I attended Operations & Maintenance, Education and Workforce Issues for BIM, and Building Respect with Specialty Contractors.

The Critical Issues Research Method section is the initial proposal to a critical industry issue in which I will propose a solution. My proposal is to compile a project specific Infection Control Risk Assessment report for Civista Medical Center. Furthermore, I will investigate the correlations between commissioning and O&M, and Infection Control. This research will provide a solution to Civista's Infection Control plan and present helpful insight to industry members regarding commissioning, O&M, and Infection Control relationships.

In the Problem Identification section, I listed problematic issues present during the construction of Civista Medical Center. Following discussions with the design and construction team, I have also provided preliminary solutions. From the proposed issues, I have selected two item to further conduct my research; CIP concrete vs. structural steel and revise / reroute MEP.

The Technical Analysis Methods section displays the methods I will use to analyze my topics. The main areas of focus will be value engineering, constructability, and schedule reduction. Finally, a weight matrix is included on the to exhibit the distribution of my efforts.

Critical Industry Issues

The PACE Roundtable Meeting was an excellent way to gather numerous industry members with different backgrounds to discuss today's market and industry issues. I was surprised by the willingness of contractors and construction managers to discuss their insight on key issues. All members provided great conversation and offered many ideas towards our thesis research. I personally benefited the most from the knowledge I gained in the first session, *Operations & Maintenance*. Some ideas for related research included: "Do commissioning systems perform better or worse with LEED certification?", "Do building types play a role in a smoother O&M transition?", and "Do different parties during the design phase resulted in a better startup?" Commissioning and O&M are all vital to a Hospital's success, due to the complex MEP systems it houses. This particular discussion has made me interested in investigating the affects of Operations & Maintenance and its relation to Infection Control.

Key Contacts: Dr. Riley, Marilyn Juban

Session 1 – Operations & Maintenance

Key Topics:

1. What are the most common forms of call-backs and maintenance problems in recently completed buildings?
    a. Leaks
    b. Don't know how to operate equipment – lack of training
    c. Plumbing issues (toilets won't flush)
    d. Defective door hardware
    e. Mechanical problems

2. What best practices can be applied during project start-up?
    a. Start planning very early in the project (design phase)
    b. Thorough testing and inspections throughout schedule duration
    c. Include all parties (Owner, A/E, Specialty Contractor, Commissioning Agent, etc.)

3. How can owners best prepare O & M teams on new building projects?
    a. Start planning very early in the project (design phase)
    b. Contractor can sell a maintenance contract to the owner – Preventative maintenance to cover warranties
    c. Entire O & M teams require sufficient training, not just one individual

Session 2 – Education and Workforce Issues for BIM

Key Topics:

1. How do we educate the current workforce to allow them to adopt BIM, and how drastically should our current training programs change?
    a. Currently, BIM is an added bonus to a company
    b. Educate in-house
    c. Hire for entry level positions that are familiar with BIM and its related software
    d. Until BIM becomes a mainstream necessity, training programs are yet to be implemented

2. What should graduates from the AE Program and other programs know about BIM?
    a. Definition and how it's affectively used
    b. How BIM helps a company
        i. Receive work (use in RFP)
        ii. Solve coordination issues (MEP)

3. What opportunities does BIM provide to new students entering the job market?
    a. Added skill that impresses recruiters
    b. Knowledge management
        i. System components
        ii. How system are integrated with a schedule

4. How could BIM be used as a training tool within the company?
    a. Allows for detailed understanding of systems and its components
    b. Implements a schedule to the required work
    c. Can be an excellent method to communicate to various audiences

5. What opportunities does BIM create for knowledge management?
    a. Relates building systems to a schedule
    b. Aides in coordination issues
    c. Acts as a communication tool

Session 3 – Building Respect with Specialty Contractors

Key Topics:

1. How can builders best earn the respect of specialty contractors?
    a. Honesty
    b. Loyalty
    c. Being personable
    d. Work toward a common goal

2. What are the indicators of respect by specialty contractors? How does this affect projects?
    a. More efficient – less time spent on conflicts
        i. Lowered chances of falling behind schedule
        ii. Opportunity to save money
    b. Better quality product – looking out for the contractor (QA)
        i. Less changes – more agreements
        ii. Save money, save time

3. What are the most common ways to lose respect of specialty contractors?
    a. Lying
    b. Not assuming responsibilities
    c. Making unreasonable demands
    d. Being unfriendly
    e. Avoiding on-site interaction

Critical Issues Research Method

Problem Statement

Infection Control Risk Assessment addresses specific threats associated with the air quality environment during the construction. It is a strict requirement on all medical facility projects per the 2001 edition of the *American Institute of Architects (AIA) Guidelines for Design and Construction of Healthcare Facilities*. This requirement was later made mandatory by the *Joint Commission for Accreditation of Health Care Organizations (JCAHO)*.

Commissioning building systems and proper operations & maintenance (O&M) of those systems is essential to a properly functioning building. It may be possible that by budgeting more funds in commissioning and O&M, fewer problems may be encountered during ICRA. This theory may be more accurate when assessing Infection control years in future, after the completion of the project.

Research Goal

The goal of this research is to compile a project specific Infection Control Risk Assessment report for Civista Medical Center. Furthermore, I will investigate the correlations between commissioning and O&M, and Infection Control. This research may benefit those contracted to build hospitals, labs, or any other building where Infection Control Assessments are an issue.

Research Steps

1. Before developing an Infection Control Risk Assessment report, I must first spend time familiarizing myself with the subject matter.

2. Before addressing ICRA and commissioning / O&M correlations, I will further my knowledge in commissioning / O&M procedures.

3. Interview industry members to relate their past experiences with the one being addressed. Find out their interests, concerns, and ideas.

4. Compile the results of the aforementioned step to clearly define my path of research (i.e. what commission / O&M steps may benefit ICRA)

5. Develop the ICRA report along with commission / O&M correlations.

6. Provide Industry members with findings and request their feedback.

Sample Survey

Infection Control Risk Assessment (ICRA) Survey

Name:

Position:

Company:

Yrs. Experience:

Please complete the following questions listed below. It is for information purposes only and will be kept confidential. The cumulative results will be tabulated and published in correspondence to my senior thesis project. Thank you.

1. Have you ever participated on a project requiring ICRA? **YES NO**

2. Was Infection control separately budgeted? **YES NO**

3. Was there 3rd party involvement? **YES NO**

4. If yes, was it beneficial to the project? Why?

5. How often was the ICRA revised throughout the project?

6. At was phase was ICRA implemented (i.e. beginning of design phase, end of design phase, beginning of construction, etc.)?

7. In your opinion, when would have been the ideal time to apply ICRA? Why?

8. Did commissioning and/or operation & maintenance issues affect ICRA short-term or long-term? How?

9. Were there any other issues that affected ICRA short-term or long-term? What were they and how did they affect it?

10. Was ICRA successful on your project(s)? **YES NO**

11. If no, what could have been done differently?

*** Please save the completed survey and send it via email to* tjm286@psu.edu. *Thank your for you time.*

Problem Identification

Listed below are some of the most significant problematic issues that arose during the construction of Civista Medical Center. This list has been compiled after consulting with the construction team. From this list, proposal topics will be chosen.

- ***Foundation System***
  - **Mat Foundation vs. Piles and Pile Caps**
    - The buildings foundation system was constructed using augered cast-in-place pile foundation system. Cast-in-place pile caps along with grade beams tie the foundation system together. The slab on grade is then placed at a typical 5" depth.
    - A mat foundation is a system that was recommended by the geotechnical engineer as an alternative to the pile system. It is basically a large spread footing that would eliminate the need for deep excavation. An in-depth analysis would compare the actual schedule, costs, performances, and material availability between the two.

- ***Structural***
  - **CIP Concrete vs. Structural Steel**
    - The building primary structural system is CIP, two-way concrete slabs supported by CIP square columns. However, it was decided to use structural steel at Civista's loading dock and access bridge locations. The requirements of steel erection include crane mobilization, long lead time, and shakeout/laydown areas. Also, at a time when steel prices are high, CIP advantages could be great.
    - A CIP concrete system was recommended by the project construction team. It's believed that this alternative system will alleviate the headaches brought on by the steel construction. An in-depth analysis would compare the actual schedule, costs, performances, and material availability between the two.

- ***Mechanical Systems***
  - **Revise / Reroute MEP**
    - The mechanical construction drawings indicate the impossibility of routing addition piping through the existing hospital. The goal here is to propose an acceptable method to rerouting the MEP to its required locations.
    - An in-depth analysis would detail changes to the actual schedule, costs, performances, and material availability.

Technical Analysis Methods

From the previous section, Problem Identification, two of the topics have been chosen for further research. A CIP system in lieu of a steel system will be one and revising and rerouting the MEP will be the other. As shown below, these technical analysis methods will be exercised. An example will be provided for each.

Value Engineering Analysis

- CIP Concrete vs. Structural Steel
  - Using consistent materials and equipment already provided onsite should drastically reduce costs.
- Revise / Reroute MEP
  - Alternative method may result in a more efficient use of materials.

Constructability Review

- CIP Concrete vs. Structural Steel
  - The steel system had structural issues. The accesses bridge had steel stud failures that had to be repaired.
- Revise / Reroute MEP
  - The design layout cannot be constructed. This alternative layout should alleviate all constructability problems.

Schedule Reduction / Acceleration Proposal

- CIP Concrete vs. Structural Steel
  - With no lead time, readily available materials and equipment, and no repairs, the CIP alternative should save time.
- Revise / Reroute MEP
  - It may have reduced the schedule if discovered during the design phase.

Weight Matrix

Below is a weight matrix. It displays how I plan to distribute my workload while analyzing the issues I am proposing.

Description	Research	Value Eng.	Const. Rev.	Sched. Rev.	Total
CIP Concrete vs. Structural Steel		10%	13%	10%	33%
Revise / Reroute MEP		10%	18%	5%	33%
ICRA / Commissioning / O&M	34%				34%
Total	34%	20%	31%	15%	100%