Final Thesis Proposal

The Wilmer Eye Institute Outpatient Surgery & Laboratory Building

Baltimore, Maryland

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Construction Management

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Mud mat under mat footing form

Executive Summary

The construction management thesis proposal specifically outlines the work that will be done for the remainder of the capstone project. It is meant to elaborate on the topics discussed in the third technical report and concisely report specific information about each analysis, including a problem statement, goal, expected outcome, and specific measureable research steps.

In this case, four issues were chosen for further research and examination. These include ICRA (Infection Control Risk Assessment), building envelope construction, prefabrication opportunities, and a future plan for a three-storey expansion. Each issue will include an element of research while also examining constructability, value engineering, and schedule acceleration possibilities.

Included herein is an introduction that profiles the project and identifies breadth studies, a technical description of each analysis, and a proposal summary.

Workers place concrete for mat foundations

Introduction & Breadth Studies

The basis of this thesis study will revolve around patient safety and mitigating any risks associated with building construction projects in large hospitals. The Johns Hopkins Hospital is an established organization, and the Wilmer Eye Institute is a world-renowned eye hospital. An error in this regard can put patient's lives at risk, and an entity as legitimate as this one (or any hospital for that matter) is something that simply cannot be tolerated. This building will eventually be a patient surgery building and research lab, and is also adjacent to other patient hospital facilities. It is extremely important that the utmost care is taken regarding infection control measures.

Prefabrication seems to be happening more and more in the modern construction industry and could prove itself to be quite a valid option on this project. Prefabrication is known to reduce the amount of waste and debris produced on site, therefore posing less of a threat to the air quality of adjacent hospital facilities. The building's exterior wall system can also be a health risk if not properly designed and constructed. Problems with waterproofing could lead to mold growth that could contaminate the air and pose a threat to patients and occupants of the building.

The three-storey expansion was chosen simply because there are a number of different ways plan and build an addition like this one. This analysis affords the opportunity to analyze and research a number of different aspects of the design and construction of engineered systems. It also deals with the issue of construction in buildings that are already occupied, and the effects of system shutdowns on regular hospital operation.

All architectural engineering students are required in their thesis to demonstrate breadth in at least two areas outside of their chosen option of study. The breadth studies in this thesis project will be in the areas of (1) mechanical and (2) electrical design and construction. The expansion analysis affords the opportunity to recommend alternate configurations for these engineered systems that will require investigation of the cost and constructability issues associated with each option. Activities will include (but is in no way limited to) resizing major equipment based on anticipated building loads, calculating costs associated with changing equipment sizes and altering construction processes, and creating a timeline of energy consumption and costs. Completing all of the technical activities associated with proposing an alternate configuration for two different systems should adequately demonstrate the required breadth studies of this capstone project.

Infection Control Risk Assessment (ICRA)

Problem Statement

Infection control is an extremely critical element in healthcare construction, as renovation and new construction projects are one of the leading causes of patient deaths in hospital buildings today.

Goal

This analysis will investigate and critique the project's current infection control measures to ensure the hospital's utmost protection from the risks associated with building construction hazards.

Research Steps

1. Preliminary research
    a. Obtain and study the AIA's infection control guidelines for healthcare construction
    b. Investigate other sources (world wide web, similar projects, etc .)
2. Survey the hospital's current infection control measures
    a. Establish legitimate interview/survey format
    b. Seek out individuals in charge of ICRA at the hospital
    c. Set up and conduct interviews to get up to speed with the current infection control efforts concerning the Wilmer project, as well as facilities work in general
3. Assess gathered information
    a. Conduct further research to determine adequacy of current measures
4. Establish additional infection control possibilities
    a. Investigate constructability, cost, and schedule effects of proposed actions
    b. Seek out more professional opinions via interviews, etc.
    c. Assess prefabrication as a legitimate option in mitigating health risks
5. Make an educated statement as to whether or not further action could/should be taken

Expected Outcome

The main intention of this analysis is to become familiar with infection control practices in contemporary healthcare construction. An optimal situation would be to learn that Johns Hopkins Hospital is already doing everything that is possible to mitigate these risks. If necessary, however, an educated recommendation will be made on behalf of research and professional opinion.

Future Three-Storey Expansion

Problem Statement

Major mechanical and electrical equipment has been sized to accommodate the load of three additional stories and will be operating inefficiently until the expansion is constructed.

Goal

The goal of this technical analysis is to identify alternative system designs and/or construction methods that more proficient regarding cost, constructability and energy efficiency.

Research Steps

1. Develop initial list of questions to be used to gather information regarding expansion plans
    a. Johns Hopkins Hospital Facilities Staff
    b. RMF Engineering (MEP Engineers)
    c. Schirmer Engineering (Code Consultants)
    d. Whiting-Turner (General Contractor)
    e. Baltimore City's code administration
2. Survey project staff to learn specific plans for the expansion
    a. Seek out staff dealing with expansion planning
    b. Get up to date with prior and most recent advancements in plans
    c. Establish timeframe in which code will be amended and expansion will be constructed
3. Reflect on data collected
    a. Research alternate design/construction methods
        i. Consult with students in other options
        ii. Study building products on the internet
        iii. Consult professionals
    b. Make final decision on which systems/components to analyze
        i. Run these by the design professionals to collect feedback
4. Propose alternate system design/construction schemes
5. Estimate costs and savings associated with each proposed scheme
    a. Material and equipment costs/savings
    b. Constructability issues / schedule compression
        i. Including the effects of system disconnects on regular building function/operation during expansion construction
    c. Value engineering opportunities
    d. Equipment energy consumption
6. Weigh in all factors and make an educated recommendation

Expected Outcome

This analysis should yield an alternate plan for the design and construction of at least one of the engineered systems that is more cost-effective, easier to construct, and will use less energy.

Looking Northeast from center of site

Building Envelope

Problem Statement

Certain elements of the building's cladding system are not clearly defined in the construction documents. Faults in the construction of the envelope and waterproofing could result in unwanted leakage and mold growth that could potentially pose a health risk to patients and everyday building occupants.

Goal

The purpose of this analysis is to ensure a fully functional building envelope by clearly defining the manner in which it will be constructed, while also investigating alternative designs and construction methods.

Research Steps

1. Examine construction drawings and specifications in depth
    a. Make as much sense as possible from the contract documents
    b. Define any vague, unclear, or "grey" areas
2. Prepare an initial list of issues to address
3. Collect information from the project staff
    a. Find out exactly which parties are responsible for the design and construction of the cladding system, and how they are communicating
    b. Resolve drawing issues by becoming familiar with the current envelope scheme
        i. System design
        ii. Construction plans
        iii. Operating conditions/criteria
4. Critique the current system
    a. Consult with building envelope specialists RDH Group (www.rdhbe.com)
    b. Consult with faculty and other students
    c. Research outside sources (internet, etc.)
5. Research alternatives
    a. Analyze in regard to dampproofing, insulative properties, cost, and constructability
    b. Look into prefabrication opportunities
        i. Schedule compression
        ii. Infection control
        iii. Constructability issues
6. Draw an educated conclusion on the integrity of the current building envelope plan, and if needed recommend alternative schemes

Expected Outcome

This investigation should clarify any discrepancies there may be in the construction documents and eliminate any issues between the design and construction of the building envelope. A better understanding of building cladding systems will be achieved by critiquing the current system, researching alternatives, and if needed, recommending a different scheme.

Looking South from center of site

Prefabrication

Problem Statement

Off-site fabrication of major building components could prove to be a viable option in schedule compression and infection control, and needs to be investigated further in depth.

Goal

To find practical uses of prefabrication that could potentially shorten the duration of construction, save money, and create a safer and healthier environment for the hospital's patients.

Research Steps

1. Identify any building components that could potentially be prefabricated
2. Determine preliminary feasibility for each item
    a. Call manufacturers and material providers
    b. Bounce ideas off project staff
        i. Company responsible for installing each item
        ii. General contractor
        iii. JHH Facilities
    c. Contact companies in area that do similar work
3. Analyze information collected
    a. Constructability
    b. Schedule effects
    c. Value engineering opportunities
    d. Cost analysis
4. Come to a conclusion for each item as to whether or not prefabrication is a viable and beneficial alternative

Expected Outcome

This investigation should yield feasible opportunities for building components to be fabricated in portions off-site and delivered to the project. It is anticipated that this analysis will closely tie-in with the infection control and building envelope analysis.

Summary

The most legitimate part of the senior thesis capstone project is the amount of real-world knowledge and skills achieved throughout the process. The content that will be analyzed here could transfer right into many post-graduation building engineering jobs that students in Architectural Engineering seek.

The building cladding analysis in particular is personally of the most importance, as a company that specializes in the building envelope is being seriously considered as a potential employer. The aspects of medical construction and infection control are also especially interesting, as my internship this past summer was with Johns Hopkins Hospital working on the New Clinical Building, and it was thoroughly enjoyed.

It is anticipated that a number of crucial skills will be refined throughout this project, including but not limited to industry communication, construction methods and products research, and document reading. These skills will be extremely useful to have refined upon entering the industry post-graduation. This senior thesis project is a truly unique opportunity.

Weight Matrix

Analysis Description	Research	Value Engineering	Constructability Review	Schedule Reduction	Total
ICRA	8	5	5	2	**20%**
Prefabrication	2	2	4	7	**15%**
3-Storey Expansion	10	10	10	5	**35%**
Building Envelope	10	5	10	5	**30%**
Total	**30%**	**22%**	**29%**	**19%**	**100%**

Spring Semester Timeline

Task	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
Prefabrication Analysis									Spring Break
Expansion Analysis									
Building Envelope Analysis									
ICRA Analysis									
Prepare Presentation									
Finalize Thesis Report									

Task	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18
Prefabrication Analysis					Presen-tations			Finals	Gradu-ation!!!
Expansion Analysis									
Building Envelope Analysis									
ICRA Analysis									
Prepare Presentation									
Finalize Thesis Report									

Temporary Water Connection