Office Building

Washington, D.C

Katey Andaloro

Construction Management

Dr. John Messner

Thesis Proposal

December 12, 2008

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Executive Summary

The proposed senior thesis identifies the topics I plan to research and analyze using The Office Building project in Washington, D.C. For each area of analysis, I define the problem, along with the goal intended for my research, the research steps I will use, and the expected outcome of the study. I also included a calendar to provide a tentative schedule of how I will progress through each of my proposed analyses. Finally, a weight matrix is included at the end of the document to suggest my intended time distribution among the areas of analysis relating to research, value engineering, constructability review, and schedule reduction. A brief description of each analysis is provided below.

Analysis #1: M Street Ramp Re-design – Steel Structure vs. Concrete (Structural Breadth)

This analysis will focus on re-designing the structural system above the M Street Ramp, by converting the steel structure to a complete CIP concrete structure. A cost, constructability, LEED, and schedule analysis will be completed to determine the effects of the change.

Analysis #2: Implementing LEED in the Design Phase (Critical Issues Research Method)

LEED will be considered in the initial design of the building so as to provide a more accurate cost and execution plan, therefore avoiding any complication created from the LEED change order added to the project after construction began.

Analysis #3: Pre-Designs for Tenant Fit-Out (Architectural Breadth)

This analysis attention is on designing a space or area that will accommodate the expectations of several different Class A tenants that would wish to acquire office space in the Washington, DC area.

Analysis #4: Utilization of Short Interval Production Schedule (SIPS)

A SIP schedule will be utilized to explore the positive and negative implications to the overall project schedule, along with allowing easier tracking of production based on standardized work zones and task durations, and including a possible earlier turnover date to the owner.

Analysis #1: M Street Ramp Re-design – Steel Structure vs. Concrete (Structural Breadth)

Figure 1 & 2: the M Street Ramp Steel Structure

Problem Statement

The Office Building is primarily a cast-in-place (CIP) concrete structure with a post-tension system, however part of the building, specifically the structure above the M Street Ramp, is composed of structural steel framing and composite metal decking with CIP concrete flooring. Due to the structural steel and composite decking being erected after the primary structural systems are complete, separate pours must be made for the CIP concrete infill along with the erection of the steel. The underlying notion is that maintaining a CIP concrete structure is more efficient than the actual CIP building and steel structure combination. Some unfavorable issues related to the structural steel frame include the depth of the members, the lead time associated with steel shop drawings and procurement, the increasing costs of structural steel, and site congestion.

Goals

Utilizing concrete instead of the structural steel would allow the team to construct one complete level of the building as they progress upward. This would eliminate the time needed for construction on what feels like a "separate" entity of the overall building. By re-designing the structural system above the M Street Ramp, converting the steel structure to a completely concrete structure, a cost, constructability, LEED, and schedule analysis would be completed to determine the affects of the change.

Research Steps

1. Structural drawings will be studied and analyzed relating to current structural steel system, specifically typical bay system between the 5th Level and 10th Level.
2. Obtain detailed assembly data and structural analysis methods on CIP concrete construction from general contractor and AE Faculty.
3. Do basic calculations to find the spacing and approximate size for proposed structure using CIP concrete.
4. Design a detailed structural system and compare with the structural steel system
5. Develop a cost estimate, schedule, and LEED design for the CIP structural system
6. Compare steel structural system to CIP structural system and select the structure that will support the best overall project outcome.

Expected Outcome

By changing the M Street Ramp structural system from structural steel to CIP concrete, it would simplify the planning and speed up the construction of the project by having fewer contractors involved. Also, by utilizing only CIP concrete there should a lower cost and maintain the LEED Silver certification through a more simplified construction process.

Analysis #2: Implementing LEED in the Design Phase (Critical Issues Research Method)

Problem Statement

During the bidding phase, the Office Building was non-LEED rated. However, with LEED certified buildings becoming the future in construction, the owner wished to achieve a LEED Silver rating for the project. Thus a LEED design was noted as a bulletin to the drawings and priced as a change order to the contract.

Goals

If LEED was considered in the initial design of the building, a more accurate cost and execution plan could have been developed, therefore avoiding any complication created from the change order. Through this the owner can see the impacts on the design process, and could have allocated to obtain more points at the beginning of construction.

Research Steps

1. Contact the owner, architect, and construction manager of the Office Building project to determine why LEED designs were added to the project.
2. Review the applications and effects (cost and schedule) the LEED Change Order had on the Office Building project.
3. Research how to LEED designs are incorporated and considered into initial building development by talking to industry professionals and owners with LEED rated buildings.
4. Compile response.
5. Evaluate the cost, execution, and schedule effects that LEED design would impose on the project if proposed on initial project development.
6. Develop conclusion, and determine if other areas of LEED design could have been incorporated into building design phase.

Expected Outcome

Incorporating LEED designs at some point in the design phase of the project could allot a decrease in the overall building cost. This will also allow for the project team to execute a better plan and schedule in the implementation of LEED designs throughout the building. Lastly by evaluating the LEED in the initial design, it allows more opportunities to efficiently invest in obtaining a possible higher LEED rating, such as Gold.

Analysis #3: Pre-Designs for Tenant Fit-Out (Architectural Breadth)

Problem Statement

Since BBC's contract with the owner does not include a tenant build out package for the multipurpose office building. I would like to investigate the benefit to providing pre-approved typical office layouts/designs available to the tenants upon signing their leasing contracts.

Goals

The goal of this analysis is to design a space or area that will accommodate the expectations of several different Class A tenants who would wish to acquire office space in the Washington, DC area. Upon crafting this interior space, LEED designs will be incorporated throughout the Commercial Interiors.

Research Steps

1. Interview potential tenants to obtain information of what areas the tenant would like to have in a selected space(s) of the building.
2. Review LEED criteria for interior spaces and select which ideas are obtainable.
3. Design several layouts of selected building space.
4. Receive tenant input on designs.
5. Make necessary changes upon feedback.
6. Review the architectural intent and high performance components, to ensure documents coincide. This will provide a more finalized list of anticipated LEED points.
7. Choose LEED materials.
8. Develop a cost estimate and architectural plan for each layout for proposed tenants.

Expected Outcome

The owner could present these examples of possible highly professional office layouts/designs to an array of qualified tenants, thus obtain the tenants interest in perhaps leasing space from the owner.

Analysis #4: Utilization of Short Interval Production Schedule (SIPS)

Problem Statement

The current schedule is highly efficient in accelerating most areas of the project, except for the building service core and restrooms. The implementation of a short interval production schedule (SIPS) could aid in an overall schedule reduction along with improvements in trade flow and organization within the main buildings services core and restrooms.

Goal

A SIP schedule will be utilized to explore the positive and negative implications to the overall project schedule. The focus of the SIP schedule will be on the Lower Level to 10th Level, due to the repetitious design of the service cores and restrooms. The goal of utilizing the SIP schedule is to allow for easier tracking of production based on standardized work zones and task durations along with obtaining an earlier turnover date to the owner.

Research Steps

1. Perform independent research on SIPS techniques and objectives.
2. For the Class A office building, divide the service cores of each typical floor into four equal areas and the restroom into two equal areas.
3. Determine the amount of time to complete each task by talking to industry professionals and using R.S. Means.
4. Create a SIP schedule based on the equal areas of construction and the equal time intervals to complete each task, starting at the 10th Level and working down to the Lower Level.
5. Figure out the total amount of time saved in the project schedule by using a SIP schedule.
6. Identify challenges of utilizing SIP schedule on the office building.
7. Identify solutions to challenges.

Expected Outcome

This research should expose some of the challenges related to utilizing a SIP schedule, particularly on a Class A core and shell office building, solutions will be proposed after the challenges are clearly identified. The SIP schedule will also decrease the overall schedule time, enough to allow for early turnover to the owner. However, a SIP schedule is highly dependent on each trade completing their work in the given amount of time provided, which can be very challenging to coordinate and plan to get them all on the same page. Therefore it is important that all trades and subcontractors fully buy-in to the utilization of a SIP schedule, thus making it easier for the general contractor to track and communicate through the schedule.

Conclusion

In performing these analyses, I expect to learn much more about the office/retail building project and what went on during the design and construction phases. Along with that, I hope to find areas where there is potential for improvement. I plan to develop skills in identifying problems and being able to research and analyze them in great detail. I look forward to discussing issues involved in my analyses with industry professionals including developers, architects, and general contractors, and gaining valuable industry knowledge from those discussions. There are always lessons you learn while working on any construction project, and it is important to evaluate them after each project is complete to take the lessons with you for your career in the future. Through analyzing critical construction issues in terms of value engineering, constructability, and schedule reduction, it will make me more aware of the goals in being a successful member of the industry.

Weight Matrix

The following weight matrix is a breakdown of the emphasis on value engineering, constructability review, and schedule reduction for each technical analysis:

Description	Research	Value Engineering	Construction Review	Schedule Reduction	Total
Analysis #1	5%	10%	15%	5%	***35%***
Analysis #2	10%	5%	5%	5%	***25%***
Analysis #3	5%	5%	10%		***20%***
Analysis #4	5%			15%	***20%***
Total	***25%***	***20%***	***30%***	***25%***	**100%**

Thesis Calendar

January-09						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
				1 **Winter Break** →	2	3
4 →	5	6	7	8	9	10
11 →	12 **Obtain LEED Change Order & Interview Design Build Entity / Research CIP Concrete Structure**	13	14	15 →	16	17
18 **Redesign Ramp Structure using CIP Concrete Structure** →	19	20	21	22	23	24
25 **Create Estimate, Schedule, & LEED Analysis for Both Structures** →	26	27	28	29	30	31

February-09						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
1 **Conclude Analysis of Two Structural Systems for M Street Ramp / Interview Industry Professional about Implementing Early LEED Designs** →	2	3	4	5	6	7
8 **Create & Evaluate Cost, Execution Plan and Schedule Effect of Initial LEED Designs** →	9	10	11	12	13	14
15 **Conclude Analysis LEED Designs during Planning Phase / Interview Potential Tenants & Research LEED Interior Criteria** →	16	17	18	19	20	21
22 **Design Several Layouts & Submit to Potential Tenants for Review/** →	23	24	25	26	27	28

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March-09						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
1	2	3	4	5	6	7
Revise Layouts & Choose Interior LEED Materials / Research SIPS & Develop Work Zones →						
8	9	10	11	12	13	14
Spring Break →						
15	16	17	18	19	20	21
Finalize Interior Plans and Estimate / Conclude Analysis of Pre-Designed Tenant Fit-Out →						
22	23	24	25	26	27	28
Determine SIPS Task Times & Create Schedule / Conclude Analysis of Utilizing SIPS →						
29	30	31				
Complete Senior Thesis →						

April-09						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
			1	2	3	4
→						
5	6	7	8	9	10	11
Complete Senior Thesis →						
12	13	14	15	16	17	18
Present Senior Thesis →						
19	20	21	22	23	24	25
26	27	28	29	30		

Appendix A

Breadth Studies

Breadth Studies

Structural Breadth* - Analysis #1: M Street Ramp Re-design – Steel Structure vs. *Concrete

This analysis will focus on re-designing the structural system above the M Street Ramp, by converting the steel structure to a complete CIP concrete structure. A cost, constructability, LEED, and schedule analysis will be completed to determine the effects of the change.

***Architectural Breadth* - Analysis #3: Pre-Designs for Tenant Fit-Out**

This analysis attention is on designing a space or area that will accommodate the expectations of several different Class A tenants that would wish to acquire office space in the Washington, DC area.