Office Building

Washington, D.C

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Construction Management

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Thesis Proposal

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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, 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: Utilization of Short Interval Production Schedule (SIPS)

A SIP schedule will be utilized from the 3rd level to the 10th level so as 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.

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

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, 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 5^{th} Level and 10^{th} Level.
2. Obtain detailed assembly data and structural analysis methods on CIP concrete construction from general contractors and Professor Parfitt.
3. Do basic calculations to find the spacing and approximate size for proposed structure using CIP concrete.
4. Design a functional CIP concrete system.
5. Evaluate and redesign, where necessary, the mechanical system’s duct located on each level between the 5^{th} Level and 10^{th} Level of the new M Street Ramp structure
6. Develop and evaluate the construction impacts created by the new M Street Ramp structure, such as the cost estimate, schedule, workforce, safety, constructability, and LEED design
7. Compare steel structural system to CIP structural system and select the structure that will support the best overall project outcome.

Expected Outcome

Upon completing the research needed to effectively design and implement a new CIP concrete structure for the M Street Ramp, an evaluation can be made as to which of the two structural system, steel or concrete, will ensure an overall better design choice for the project.

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

Identify why the owner chose to pursue a LEED design after the initial design process, whether through the desire to implement green design into the project or control energy consumption through facility management driven by today's economy.

Research Steps

1. Contact the construction manager and owner of the Office Building project to determine why LEED designs were added to the project.
2. Depending on answer to previous step;
    a. Owner Driven:
        i. pursue research in developing how LEED designs are incorporated and considered into initial building development by talking to industry professionals and owners with LEED rated buildings
        ii. Review the applications and effects (cost and schedule) the LEED Change Order had on the Office Building project.
        iii. Compile response.
        iv. Evaluate the cost, execution, and schedule effects that LEED design would impose on the project if proposed on initial project development.
        v. Develop conclusion, and determine if other areas of LEED design could have been incorporated into building design phase.
    b. Energy Consumption Driven:
        i. pursue research in the connection between the owner and International Facility Management Association (IFMA)
        ii. Contact a member of IFMA to verify if any connection exist currently between informing owner of IFMA in LEED design implementations
        iii. If the connection already exists evaluate it effectiveness
        iv. If the connection does not exist create away IFMA can contact owner about LEED design implementations and their impacts on projects

Expected Outcome

Depending on the reason as to why the owner chose to pursue a LEED design for the Office Building will determine which outcome to expect. If the owner's desired to implemented green design himself then incorporating LEED designs at some point during the design phase of the project could have allot in a more accurate cost and execution plan, therefore decreasing the overall building cost. Through this the owner can visualize the impacts on the design process, and allow for further opportunities to be made in obtaining more points at the beginning of construction. If the owner was driven to LEED design due to the desire to control energy consumption in today's world then an evaluation on how to notifying owners earlier in the in the design process with be established. Therefore establishing direct contact between the owner and International Facility Management Association (IFMA) to inform the owner of on how he or she can improve their project with any new or current green design opportunities.

Analysis #3: 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 10^{th} 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.

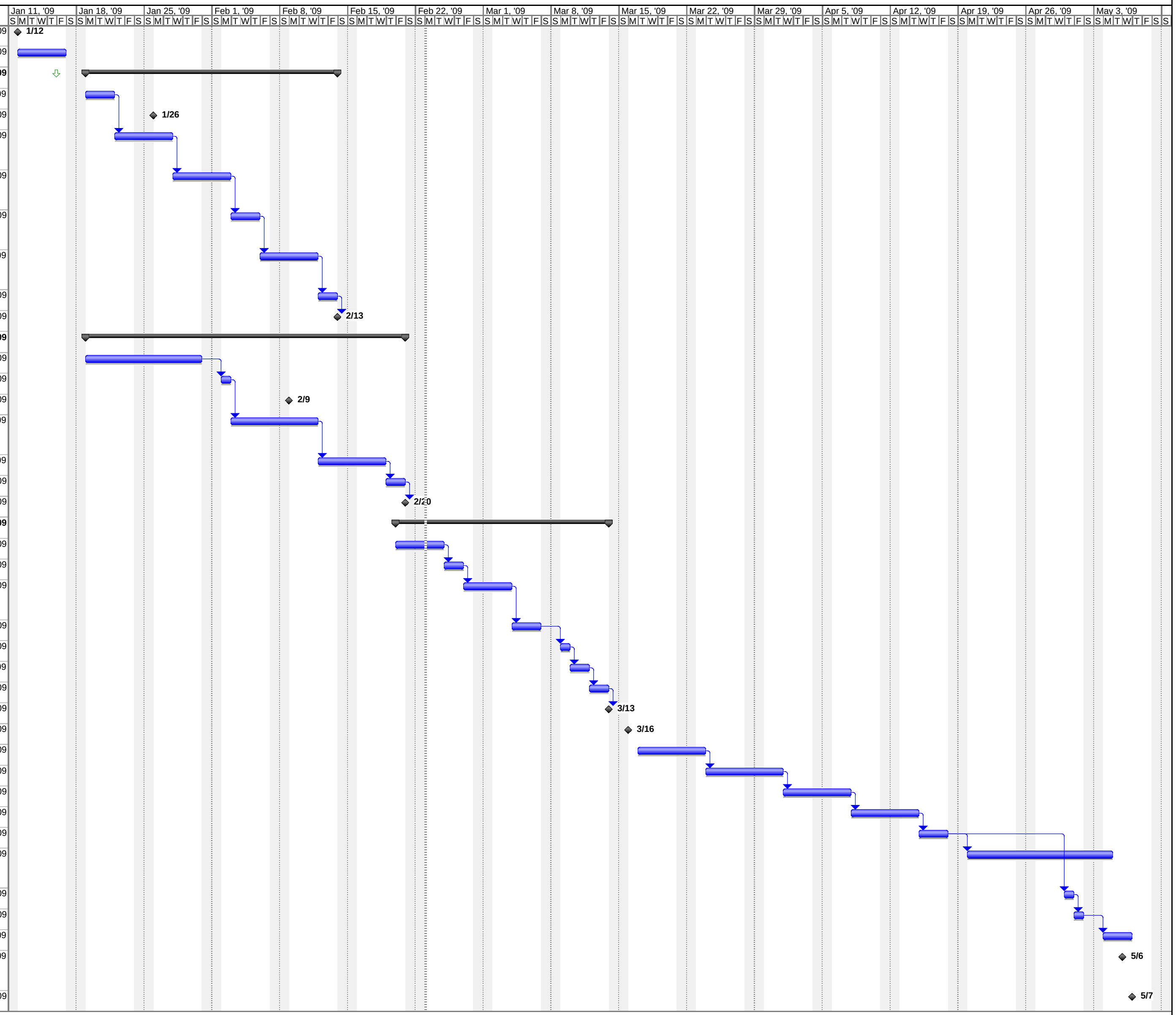
Weight Matrix

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%	10%	5%	5%	***30%***
Analysis #3	5%	10%	10%	10%	***35%***
Total	***20%***	***30%***	***30%***	***20%***	**100%**

KATEY ANDALORO - CM
OFFICE BUILDING
DR. MESSNER

ID	Task Name	Duration	Start	Finish
1	First Day	0 days	Mon 1/12/09	Mon 1/12/09
2	Initial Week of Thesis	5 days	Mon 1/12/09	Fri 1/16/09
3	**Analysis #1**	**20 days**	**Mon 1/19/09**	**Fri 2/13/09**
4	Analyze Steel Structural System	3 days	Mon 1/19/09	Wed 1/21/09
5	Jan. 26 Milestone	0 days	Mon 1/26/09	Mon 1/26/09
6	Calculations for CIP Concrete (Structural Breadth)	4 days	Thu 1/22/09	Tue 1/27/09
7	Design for CIP Concrete (Structural Breadth)	4 days	Wed 1/28/09	Mon 2/2/09
8	Mechanical Duct Redesign for New Height (Mechanical Breadth)	3 days	Tue 2/3/09	Thu 2/5/09
9	Develop and Evaluate Construction Impacts	4 days	Fri 2/6/09	Wed 2/11/09
10	Compare Structural Systems	2 days	Thu 2/12/09	Fri 2/13/09
11	Milestone - Complete Analysis #1	0 days	Fri 2/13/09	Fri 2/13/09
12	**Analysis #2**	**25 days**	**Mon 1/19/09**	**Fri 2/20/09**
13	Obtain and Review LEED Change Order	10 days	Mon 1/19/09	Fri 1/30/09
14	Interview CM	1 day	Mon 2/2/09	Mon 2/2/09
15	Feb. 9 Milestone	0 days	Mon 2/9/09	Mon 2/9/09
16	Interview Industry Professionals & Owners w/ LEED Buildings	7 days	Tue 2/3/09	Wed 2/11/09
17	Evaluate Effects on Initial Design Phase	5 days	Thu 2/12/09	Wed 2/18/09
18	Develop Conclusion	2 days	Thu 2/19/09	Fri 2/20/09
19	Milestone - Complete Analysis #2	0 days	Fri 2/20/09	Fri 2/20/09
20	**Analysis #3**	**16 days**	**Fri 2/20/09**	**Fri 3/13/09**
21	Research SIPS Techniques	3 days	Fri 2/20/09	Tue 2/24/09
22	Divid Service Core Equally	2 days	Wed 2/25/09	Thu 2/26/09
23	Determine Duration to Complete Each Task	3 days	Fri 2/27/09	Tue 3/3/09
24	Create SIP Schedule	3 days	Wed 3/4/09	Fri 3/6/09
25	Determine Duration Saved	1 day	Mon 3/9/09	Mon 3/9/09
26	Identify Challenges	2 days	Tue 3/10/09	Wed 3/11/09
27	Identify Solustions	2 days	Thu 3/12/09	Fri 3/13/09
28	Milestone - Complete Analysis #3	0 days	Fri 3/13/09	Fri 3/13/09
29	March 16 Milestone	0 days	Mon 3/16/09	Mon 3/16/09
30	One Page Presentation Outline	5 days	Tue 3/17/09	Mon 3/23/09
31	Update Presentation Outline	6 days	Tue 3/24/09	Tue 3/31/09
32	Final Report Due	5 days	Wed 4/1/09	Tue 4/7/09
33	Finish Presentation	5 days	Wed 4/8/09	Tue 4/14/09
34	Presentation Week	3 days?	Wed 4/15/09	Fri 4/17/09
35	Finalize CPEP Site Including ABET Assessment Chart, Reflection, and Any required updates	11 days	Mon 4/20/09	Mon 5/4/09
36	Evening Event	1 day	Thu 4/30/09	Thu 4/30/09
37	Awards Presentation and Banquet	1 day	Fri 5/1/09	Fri 5/1/09
38	Change Resume to Updated Bio	3 days	Mon 5/4/09	Wed 5/6/09
39	Return Keys & Complete Final Checklist to Receive Final Course Grade	0 days	Wed 5/6/09	Wed 5/6/09
40	Milestone - DONE!	0 days	Thu 5/7/09	Thu 5/7/09



Project: Bar Chart . Progress Schedule
Date: Mon 2/23/09

Task		Progress		Summary		External Tasks		Deadline
Split		Milestone		Project Summary		External Milestone		

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, and schedule analysis will be completed to determine the effects of the change.

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

Due to changing the M Street Ramp's structural system from steel to CIP concrete, a floor thickness change will occur creating a new floor height. Therefore the mechanical system's duct will be evaluated to ensure that it is correctly sized, meets specifications, and is properly place within the pendulum space.