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FINAL THESIS PROPOSAL

OFFICE/RETAIL BUILDING
WASHINGTON, D.C.



SUBMITTED: JANUARY 18, 2008

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EXECUTIVE SUMMARY

The final thesis proposal identifies the topics I plan to research and analyze using the office/retail building project in Washington, D.C. For each area of analysis, the problem is defined, along with the goal intended for my research, the research steps I will use, and the expected outcome of the study. A summary is also included to identify what skills I expect to develop throughout the research and analysis of each topic. 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 breakdown of each analysis to be conducted is described below.

Urban Development

This will involve studying a major decision that an owner faces during the beginning stages of development in an urban location: Is it better to renovate the existing building, or demolish and re-build it? There are many issues involved with making this decision from the owner's standpoint, and I plan to analyze various factors relating to the project under study.

LEED Implementation

There was no initial consideration for pursuing LEED certification on the office/retail building, and I am interested to see how worthwhile it would be based on cost and constructability implications. Since there is no current LEED Rating System for renovation projects, I will need to look at the factors in other guides to compile a list of criteria to pursue certain LEED points relevant to this project. I will also perform a structural breadth analysis on designing a roof garden.

Building Envelope Performance

The existing flashing system of the north and west façades were in poor shape and led to complications during construction. I plan to analyze the effects of cost and schedule on fully replacing the brick façade, as well as upgrading the curtain wall on the remaining façade area. I will perform a mechanical breadth analysis on the thermal performance of the curtain wall.

Short Interval Production Schedule

This project experienced some delays and complications early in construction with demolition. I would like to look at ways to recover the schedule time lost by implementing a Short Interval Production Schedule. I will also evaluate the challenges of using this scheduling method.

INTRODUCTION

Project Background

This existing downtown 10-story office/retail building was fully-renovated with a new façade and state-of-the-art building systems. Located at a street corner of the D.C. business district, this newly developed design prominently sets itself apart from its surrounding buildings. The new “skin” of the building features a glass curtain wall system with white metal panels on the two sides of the building facing the street, which replaces the existing strip windows and brick façade. The floor-to-ceiling glass provides office tenants plenty of natural light along with landmark views of our nation’s capital. This vertically configured design also consists of a new monumental roof cornice to add to its architectural stature. Other new features include an entrance canopy, rooftop terrace, and an enhanced retail storefront at street level. The building footprint is shaped like an “L”, which allows space for a private courtyard in the northwest corner of the site. The new glass vestibule on the east side of the building leads into an elegant lobby area highlighted by Carrara Italian Marble panels with luminous wall panels running along the perimeter.

A renovation of this magnitude presents some unique challenges to the general contractor. Any desired structural modification or MEP core drills in the existing concrete slab must be scanned for existing reinforcing bar and approved by the structural engineer, which can be a headache at times depending on how critical it may be and the time it takes to get approval. The demolition process was also hindered due to the limitations on the equipment used to not disturb the existing structure. The design team created drawings based off of 40-year-old plans while the building was occupied, thus preventing it from being analyzed and exposed. This makes the new design very subject to changes resulting from unforeseen conditions. The general contractor was responsible for constructing the base building, or the “core and shell”, while a separate tenant contractor was hired to install the finishes in the general office spaces. This joint occupancy of the general contractor and the tenant contractor presented some coordination difficulties to the job as well.

Owner Background

The owner of this project is a major commercial real estate developer in the Washington, D.C. metropolitan region. With this office/retail building, they wanted to continue establishing their presence in the business district of Washington, D.C. with a repeat contractor, Balfour Beatty Construction. Their main focus throughout the course of the project was getting their tenants moved in as soon as possible, which seemed to influence every decision made during the construction process. The faster the project was completed, the sooner their tenants would start paying rent. This mindset caused them to be “hands off” at times in terms of day to day happenings and details with the contractor of the base building project. The owner seemed to worry much more about when the tenant contractor can begin work and anything that would affect their progress. Since this job was a “hard bid” project, the owner wanted as few added costs as possible.

Key Features Leading to Analysis Topics

There were several key features of this project that lead me to choose the analysis topics of Urban Development, LEED Implementation, and Short Interval Production Schedule. Many of the challenges encountered with this type of project were unique to a renovation project, including the schedule delays from issues with selective demolition, the time impact and submittal process of core drilling through the existing concrete slab, and the coordination problems that took place in several congested areas throughout the existing building and site. This led me to wonder how the renovation project would compare to if the existing building would have been completely demolished and rebuilt as new construction. In an over-developed downtown area, such as Washington, D.C., there is very rarely new construction on a brand new site. The owner or developer either elects to renovate an existing building, like in the case of the office/retail building, or completely demolish a building and rebuild with new construction. I am interested in the selection factors and criteria the developers consider in determining the method of construction for an urban project. Along with that, I wanted to look at the potential impacts on cost, schedule, and constructability of a renovation project like the office/retail building undergoing new construction instead.

The project features additionally got me interested in looking at how the pursuit of LEED certification would either promote or inhibit the construction method. Also, the sequencing issues of the project were consistent with the main drive from the owner to get the tenant moved into the building as soon as possible. The general contractor worked from Floor 10 down in the core areas (bathrooms and electrical closets). Since the owner can lease the upper floors faster than the lower floors, the base building contractor concentrated on turning the floors over to the tenant contractor from the top down. This led me to consider the impact of planning and implementing a Short Interval Production Schedule for the core of the typical office floors, starting at Floor 10 and working down.

URBAN DEVELOPMENT

Problem Identification

A critical industry issue relating to the office/retail building project pertains to the decision made by owners and developers to either renovate an existing building or demolish and rebuild it, particularly in an urban setting. Space in a highly populated downtown area, such as Washington, D.C., is at a premium. Most times, downtown construction either involves a renovation of an existing building or a complete demolition of the existing building to be rebuilt with new construction. There are advantages and disadvantages for each method of construction, and careful analysis should be considered for each project before any action is taken. The challenge facing the industry in an urban market lies within what is the most profitable design and construction method for all parties involved to ensure a high quality building is constructed. Maximizing the space available for lease while minimizing the construction time is the key for project success in a highly-developed downtown area.

For this renovation project in particular, a few issues arose that are unique to its type of construction. During the interior demolition process, several problems came up and delayed the construction schedule. Since demolition was on the critical path, and no work could start before the interior walls were correctly gutted, a careful plan and assessment had to be done. In this case, a major problem occurred when there was confusion with the demolition contractor's scope of work, which in turn caused the project to not meet important milestone dates. In addition to the selective demolition issues, the number of core drilling submittals also produced some delay in schedule. The extensive process included scanning for existing reinforcing bar and submitting a picture to the structural engineer before getting approval. This system caused several time delays, as issues sometimes came up very suddenly and a drill needed to be made right away. This could not be done until the contractor properly documented the area in question as a submittal to the structural engineer, who sometimes took a couple weeks to return it as approved or rejected.

Goal

The goal of the research is to come up with a systematic approach to decide what the better option for a project in an urban environment is between renovation and new construction. This will mostly benefit the owner, but does involve all parties to work together and deliver the project in an efficient manner. The research will include interviewing experienced owners and urban developers to find out what their criteria includes when figuring out whether to renovate or demo and rebuild. I will aim to get at least ten industry professionals to perform the interview survey and summarize the results from those.

The research will also be used to reflect upon specifically the office/retail building renovation project. A comparison will be conducted, highlighting the impacts of cost, schedule, and constructability if the decision would have been made to demolish and reconstruct the office/retail building as new.

Research Steps

1. Perform independent research on published articles to get background knowledge in urban development.
2. Fine-tune survey questions based on research conducted.
3. Interview industry professionals, including developers, architects, and contractors to get additional information on urban development.
4. Summarize results obtained from interview surveys.
5. Create the analysis of comparing new construction to renovation to identify selection criteria on a project to project basis.
6. Use the analysis to reflect specifically on the office/retail building project, comparing cost, schedule, and constructability, among other factors.

Sample Survey

Several survey/interview questions (for developers) will include:

- Do you primarily chose to renovate over demo/new construction, or vice versa?
- What are the major factors involved with the decision?
- What are the advantages/disadvantages of each method?
- What are the biggest challenges in each method?
- What would you recommend for a project description similar to that of the office/retail building?

Expected Outcome

Through all the surveys gathered and interviews conducted, as well as further research in the area of urban development, I plan to highlight the decision factors that developers are faced with in the early stages of planning for a project in a highly populated urban area. I plan to use that research to ultimately decide whether the office/retail building was better off undergoing the renovation or not. I expect that the findings will show it was still a lot less expensive upfront and faster to construct with renovating the building than to completely demolish and rebuild it. However, it may prove to be a more valuable decision in terms of life cycle of the building and opportunity to increase leasable area to construct it as new.

LEED IMPLEMENTATION

Problem Identification

LEED certification is becoming more popular in today's design and construction industry as owners and developers are looking to become more environmentally friendly and sustainable. For the office/retail building, however, there was not much consideration for LEED certification. I am interested in investigating the systems and construction methods involved in this project and recommend areas of potential points in the LEED classification system. Since there is no LEED guide for renovation projects, I will need to figure out how to classify the rating for a project of this type.

Goal

Considering LEED factors influencing a renovation project, the goal will be to see how feasible and desirable it is for this office/retail building to achieve a LEED certified rating of at least 26 points. Also, I will investigate how the pursuit of LEED certification would either promote or inhibit the construction method of renovation versus new construction.

Research Steps

1. Perform independent research on LEED certification objectives and techniques.
2. Compare the LEED Rating Systems for "Existing Buildings" and "Core & Shell" to determine LEED point factors of a renovation project.
3. Analyze the office/retail building to see how attainable a LEED certified rating of 26 points is based on cost and schedule, among other factors.
4. Discuss my research with the owner of the office/retail building and gather his feedback on if LEED certification should have been pursued after all. This may give him something to consider for future projects.
5. Investigate and determine if LEED certification promotes or inhibits a renovation project compared to new construction.

Expected Outcome

I expect to find that it would have been worth pursuing a LEED certified rating of 26 points through the "LEED Rating System for Renovation Projects" I will put together, although it may be tough to convince the owner. Also, I expect that pursuing LEED certification somewhat inhibits a renovation project when compared to new construction based on the constraints of having an existing structure with existing building systems.

BUILDING ENVELOPE PERFORMANCE

Problem Identification

There was a major issue in the beginning of the project with the flashing system over the existing strip windows on the north and west façades of the office/retail building. The owner did not test them before construction began, and it was up to the general contractor to hydro-test the strip windows and repair each leak. This presented a major headache to the general contractor with the time delay and change orders that followed. Also, the new curtain wall installed on the south, east, and partial west façades could have had better thermal performance for the office space inside.

Goal

In order to fix the issue of a poor building envelope system, the goal is to perform an analysis on fully replacing the brick façade on the north and west faces. A better performing curtain wall system with greater thermal performance is also recommended to consider. Ultimately, a higher performing building envelope system will lead to a better quality building with a satisfied owner and tenants.

Research Steps

1. Perform independent research on flashing and curtain wall systems for leak-proof and improved thermal properties.
2. Consider how to promote a better building envelope system for the office/retail building based on cost and schedule implications.
3. Analyze the cost of a new brick façade and strip windows on the rear face, as well as a stronger thermal performance in the curtain wall system.
4. Contact the owner and general contractor to gather feedback on my analysis to see if it would have been worth upgrading the building envelope system.

Expected Outcome

I believe the analysis of replacing the entire brick façade on the north and west faces will prove to be very costly, and maybe not worth the extra cost to the owner. The breadth study of improving the thermal performance of the curtain wall, however, may have a higher initial cost, but will lead to potential savings in energy consumption and the opportunity for smaller air conditioning units supplying the office/retail building. I expect to conclude that an upgrade of the building envelope is certainly beneficial, but maybe not to the extent of replacing the entire existing north and west brick façades.

SHORT INTERVAL PRODUCTION SCHEDULE

Problem Identification

This project was strongly driven from the owner to get the tenant moved into the building as soon as possible. Once the schedule was delayed with problems involving interior demolition, the general contractor was faced with the challenge of getting back on track.

Goal

Due to the repetitious design of the office space and service cores of Floors 2-10, there is a potential for a Short Interval Production Schedule (SIPS) to be implemented. The goal is to use a SIPS in the service core area to recover a few weeks in schedule time to get the project back on schedule to meet the substantial completion and turnover date.

Research Steps

1. Perform independent research on SIPS techniques and objectives.
2. For the office/retail building, divide the service cores of each typical floor into four 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 SIPS based on equal areas of construction and equal time intervals to complete each task, starting at Floor 10 and working down to Floor 2.
5. Figure out the total amount of time saved in the project schedule by using a SIPS.
6. Contact the creator of the schedule from the general contractor to her their thoughts on using a SIPS schedule in the office/retail building.

Expected Outcome

The expected results of this research analysis topic of implementing SIPS is to decrease the overall schedule time by a few weeks, enough to recover from the delays incurred from demolition. The general contractor may be interested in my results, although I am sure there will be some other challenges pointed out with implementing this type of schedule. SIPS is highly dependent on each trade completing their work in the given amount of time allotted, which can be very challenging to coordinate and plan to get them all on the same page. Also, for a renovation project like the office/retail building, additional complications may result when implementing a SIPS than compared to a newly constructed building.

WEIGHT MATRIX

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

WEIGHT MATRIX					
Description	Research	Value Eng.	Const. Rev.	Sched. Red.	Total
New vs. Renovation	20%	5%	5%	5%	35%
LEED Certification	15%	5%	5%		25%
Building Envelope	5%	10%			15%
SIPS	5%			20%	25%
Total	45%	20%	10%	25%	100%

SUMMARY

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.