2010

Thames St. Wharf Office Building

Final Proposal Revised

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Executive Summary

This proposal is a continuation of the topics that were discussed in Technical Assignment III. It set the groundwork for the research that will be conducted during the spring 2010 semester. A major theme for this proposal is having a more integrated design and how that affects the end building product.

Analysis I: Project Delivery Method

The first analysis will be on the impact of changing from a design-bid-build delivery method to an integrated project delivery method (IPDM). This analysis will be conducted be researching case studies of projects that have been completed using an IPDM as well as hopefully interviewing industry personnel that have worked on IPDM projects. Additionally the shortcomings of the design-bid-build delivery method will be examined in the coming semester. This analysis will incorporate the MAE research requirements.

Analysis II: Southern Façade Redesign

The southern façade of the Thames St. Wharf Office Building is currently made of all glass that most likely causes large thermal gains during the summer months. This analysis will be to redesign the façade to allow less light to penetrate into the space reducing the total cooling load in the building. This analysis will look at the possibilities of using brick and glazing, a combination of clear and coated glazing or metal panels and changing all of the glazing in the building to a higher performance glazing. It is assumed that changing the curtain wall to any of the before mentioned types will change the total cost of the system as well as possibly changing the schedule so both of those areas will be examined. Analysis two incorporates the façade breadth and MAE requirements.

Analysis III: Mechanical System Redesign

Following the redesign of the southern façade it is expected that the building cooling loads will be reduced eliminating the need for such a large and extensive mechanical system. Research will be done into the different types of mechanical system available and what type will create the most comfort in the building while remaining under budget. The cost and schedule impacts of the mechanical system redesign will be evaluated. Analysis three includes the mechanical breadth.

Analysis IV: Effects of Contractor Change*

*This analysis was removed due to lack of sufficient information on the subject matter. It proved difficult to gain details of contractor defaults and what was done to alleviate any issues. All of the information needed to successfully complete this analysis is very sensitive and out of common courtesy industry members did not want to share negative information about other firms.

Background

The Thames St. Wharf Office Building is a core and shell office building being constructed on the Patuxtant River in the Baltimore Inner Harbor. The owner is Harbor Point Development, LLC. a subsidiary of H&S properties, a large real estate development firm in the Baltimore area. It is a 277,000 SF office building that has a construction cost of approximately $50 million. The building is being designed and constructed to achieve a LEED Silver Rating. A tenant fit out for 50% of the building is included in construction for the financial firm Morgan Stanley. This building will become their world headquarters and therefore is being constructed at a very high quality.

The building is being constructed on an empty lot located on the west edge of the Fells Point neighborhood of Baltimore. The lot was once home to a chemical plant that dumped contaminants into the soils. The building façade is comprised of brick and glass on the north, west and east faces and an all glass curtain wall on the southern portion overlooking the water. The building's structure is cast-in-place post-tensioned concrete on a deep foundation of concrete filled metal pipe piles. The mechanical system for the building consists of two air handling units per floor with the conditioned air being pumped under raised access floors throughout the building. The total cost of the mechanical system is approximately $10 million and is the largest line item in the building.

This building is the first in a series of buildings that will be developed by Harbor Point Development, LLC. on this site as well as the adjacent empty lot to the west. This development will become known as the Harbor Point area of Baltimore. It is part of a city master plan to connect the Baltimore Inner Harbor with the Canton neighborhood located to the east with a scenic walkway along the Patuxtant River.

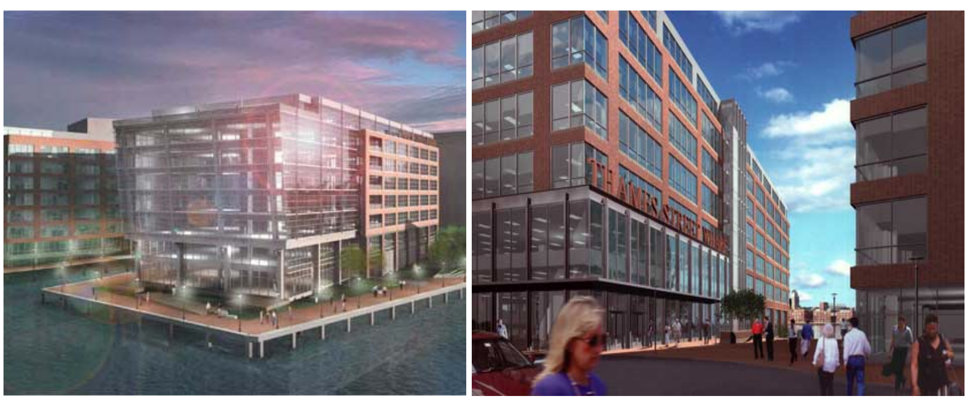

Figure 1: Renderings of the Thames St. Wharf Office Building

Analysis Descriptions

Analysis I –Project Delivery Method

Background:

The Thames St. Wharf Office Building is being delivered as a design-bid-build project with a standard GMP contract for the construction manager. Elkus Manfredi was the design architect for the project and Ayers/Saint/Gross is the architect of record. Ayers/Saint/Gross deals with all of the day-to-day design issues and concerns for the project and acts as an intermediary between Armada Hoffler, the construction management firm. All of the design consultants have their contracts held by Harbor Point Development, LLC. the project's owner. Armada Hoffler holds all of the subcontractor's contracts.

Opportunity for Improvement:

There are multiple opportunities to improve the delivery of this project. First having two architecture firms work on separate parts of the design, while common place, creates issues with errors and omissions during the construction phase of the project. If one firm worked on the project the whole way through they would have a more complete understanding of the project and the need for redesigns would be lessened. Additionally with the design-bid-build (DBB) delivery method the design is done in stages and the pieced together at the end before it is sent out for bid to the contractors. This prevents each design firm from working together. It instead means that one design is based solely on the one that precedes it and the first one does not give enough consideration to its effect on the last. For this project in particular the south facing all glass façade had a huge mechanical impact that had both design teams worked together could have been lessened. This would have saved money with the mechanical system that had to be designed and most likely in the amount of work it took to design an efficient mechanical system. Additionally with the DBB method constructability issues with the design aren't found until the bid process or during construction. Cost overruns are also possible with the DBB method if the owner does not keep a close eye on the design process.

Potential Solution:

The use of an Integrated Project Delivery Method (IPDM) could help remedy some of the issues that occur with the DBB method and that have occurred on the Thames St. Wharf project. Having all of the parties necessary to successfully complete the project on board early on and working together should in theory cut costs from redesigns and lesson the design length. It should also limit the amount of issues that occur during construction from design issues. Coordination, which was also an issue on this project, should also be much easier if the design is more integrated.

Research/Analysis:

Research will begin with case studies of projects that have been designed and built using IPD method. The efficiencies that can be gained using this method will be examined closely. Industry professionals that have worked with this delivery method will be contacted for their opinions on its effectiveness. Analysis will also include research into the basic workings of the IPDM and its benefits for all parties involved on a project.

Expected Outcome:

It is expected that this analysis will demonstrate how an Integrate Project Delivery Method can benefit a project both in terms of complete schedule from design through construction and in a more efficient design. It will be difficult to quantify potential cost savings in exact dollar amounts but it is expected that the amount of time and energy saved will in some way contribute to a dollar savings in some way.

Course Reference:

AE 372: Introduction to the Building Industry
AE 472: Building Construction Planning and Management
AE 572: Project Development and Delivery Planning

Analysis II – Southern Façade Redesign

Background:

The southern portion of the building façade is an all glass curtain wall with aluminum mullions. It gives the building a modern appearance and it gives the building occupants a large view of the Patuxtant River from the Baltimore Inner Harbor to the Key Bridge. It covers the entire southern face and the southern portions of both the east and west faces of the building. Please refer to **Figure 1:** above for a rendering of the curtain wall.

Opportunity for Improvement:

The large southern glass façade will create large solar heat gains during the summer months. This large heat gain challenged the mechanical designer to design an HVAC system that was able to handle the cooling loads during the summer months while still being energy efficient enough to earn LEED Credits. Additionally the direct sunlight coming through the windows at all points during the year will create glare and unfavorable conditions in the work spaces inside the building. This will most likely have to be remedied with solar shading that will detract from the desired views.

Potential Solution:

Decreasing the total square footage of transparent glazing on the building should reduce the summer cooling load for the building as well as the amount of glare in occupied spaces. Using brick and glazing, a combination of transparent and coated glazing or metal panels or changing the glazing to one with a higher shading coefficient will reduce the amount of light that enters the space. Reducing the amount of direct sunlight into the space should also make the space more comfortable for the building occupants by reducing the amount of glare on work surfaces.

Research/Analysis:

Research will be conducted to find the performance differences between all of the proposed systems. Constructability issues will also be examined to determine the practicality of each of system. Different glazing types will also be researched to find the best glazing type for the design goals. First an analysis will be done on the existing façade to determine the amount of cooling load that the façade contributes to the building. Next a constructability analysis of the all the proposed systems will be conducted. Then the cooling load through the proposed façade system will be calculated and compared with the existing load. A cost and schedule evaluation will also take place to determine the differences between current and proposed systems.

Expected Outcome:

It is expected that the all glazing system will be the most effective while preserving the architectural intent of the building. Using glazing with a higher R-Value and shading coefficient than the glazing that is currently being used should increase the thermal performance of the façade. It is also expected that the costs of such a system will more expensive that the current system but that the increase in cost should be minimal compared to the energy savings.

Course Reference:

Arch 441 – Architectural Design Analysis
AE 310 – HVAC Fundamentals
AE 311 – Fundamentals of Electrical and Illumination Systems for Buildings
AE 372 – Introduction to the Building Industry
AE 475 – Building Construction Engineering 1
AE 597D – Sustainable Building Methods
AE 542 – Building Enclosure Science & Design

Analysis III – HVAC System Redesign

Background:

The current mechanical system consists of two custom packaged self contained air handling units (SCU's) per floor, one serving the northern portion of the floor and the other serving the southern. Each AHU is located in its own mechanical room located in the section of floor that it serves. The conditioned air is pumped through under floor duct work to an area of floor space and then it circulates freely through vents in the floor. The current system cost approximately $10.2 million.

Opportunity for Improvement:

The current mechanical system is the most expensive line item on the Thames St. Wharf project. It is hoped that after the redesign of the southern façade the cooling loads on the building will be reduced making it possible to reduce the size of the mechanical system required to keep the building comfortable. Reducing the size of the mechanical system should reduce the total cost of the system. Additionally the mechanical system has schedule impacts and if it is able to be reduced those schedule impacts may be lessened. Finally if the SCU's could fit into one mechanical room per floor instead of two the amount of leasable floor space may be able to be increased thereby increasing the potential earnings for the owner.

Potential Solution:

To remedy this situation a redesign of the mechanical system is necessary. Within the realm of redesign there are two possible options. The first option is to decrease the cost of the system while maintaining the same energy and comfort goals of the current system. The second option is to keep the same cost of the system but to increase the system's performance. Only the first option, maintaining the same energy and comfort goals of the system, will be examined. In the current economic climate it seems more prudent to lower costs while retaining performance rather than keep costs the same while increasing performance allowing any savings to be used either elsewhere in the project or on another project entirely.

Research/Analysis:

For the analysis a single typical floor will be redesigned and then extrapolated to include the whole building. A traditional VAV system with an under floor duct system will be analyzed. Research will be done to find the most economical mechanical equipment. Schedule impacts will be examined as well. The first thing that will be examined though is cost and if the cost is prohibitive then the schedule impacts will not be examined because cost and performance are main focuses of this analysis.

Expected Outcome:

It is expected that using a VAV system will reduce the cost of the mechanical system if the performance of the new façade system is better than the existing one. It is also expected that with a smaller system installation will be easier and therefore shorter also saving money. The smaller system should also reduce the need for two mechanical rooms per floor increasing the rentable floor space.

Course Reference:

AE 310 – HVAC Fundamentals
AE 372 – Introduction to the Building Industry
AE 476 – Building Construction Engineering II

Weight Matrix & Time Table

Weight Matrix					
Description	**Research**	**Value Engineering**	**Constructability Review**	**Schedule Reduction**	**Total**
Analysis 1 – IPDM	20	5		15	40
Analysis 2 – Façade Redesign	5	10	15		30
Analysis 3 – HVAC System Redesign	5	10	10	5	35
Total	30	25	25	20	**100**

Appendix 1 – Breadth Studies & MAE Requirement

Breadth One – Mechanical

The redesign of the building façade will change the mechanical loads on the building. This breadth will include in-depth calculations of the cooling load generated on the building through the façade. Both the current and proposed façade systems will be examined. It is assumed that any of the proposed changes will reduce the amount of sunlight that enters the space.

Breadth Two – Lighting

This study examines the changes in the lighting levels inside the building from the façade change in Analysis II. It is expected that any of the systems chosen will lower the lighting levels in the space making it more comfortable for building occupants. The lighting levels for both the current and proposed façades will be calculated and discussed.

MAE Requirement

To satisfy the MAE requirement knowledge learned from two 500-level classes will be demonstrated. Course topics from both **AE 597D: Sustainable Building Methods** and **AE 542: Building Enclosure Science and Design** will be used to conduct Analysis II. In AE 597D the effects of building orientation and different sustainable building materials and systems were discussed. AE 542 introduced more effective curtain wall types and design as well as how to calculate building mechanical loads.