2010

Thames St. Wharf Office Building

Final Proposal Revised

Author: Chris Bell
Consultant: Mr. James Faust

Chris Bell
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Contents

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 One: 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 Two: Southern Façade Redesign

The southern façade of the Thames St. Wharf Office Building is currently made of all glass and is likely causes large thermal gains during the summer months. This analysis will be to redesign the façade into a brick and glass combination thereby reducing the total heat gain in the building by reducing the amount of glazing. The cost and schedule impacts of the change in the façade system will also be examined. Analysis two incorporates an architectural breadth and a portion of the mechanical breadth that will be pursued next semester.

Analysis Three: 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 research and calculations that will be done for a mechanical breadth that will presented next semester.

Analysis Four: Effects of Contractor Change

The final analysis looks into what effects the change in a construction manager or subcontractor has on a project and how those affects can be lessened. This is becoming increasingly important in these tough economic times with more firms likely to default on work that they have been contracted to complete. Industry personnel that have worked on projects where contractors have defaulted will be interviewed about what some of affects of the failure were and how those affects could have been lessened or prevented as well as what was done.

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 1 –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 2 – 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 glazing on the southern portion of the building should reduce the summer cooling load for the building as well as the amount of glare in occupied spaces. Incorporating a brick and glass façade that matches the rest of the building should achieve this goal. It will also help the building match the Bond St. Wharf Building located one block to the east of the Thames St. Wharf Building. Bond St. Wharf is a turn of the century brick and glass building that has been recently renovated into an office building with retail on the ground floor, much like the Thames St. Wharf Building.

Research/Analysis:

Research will be conducted to find the difference in R-Values between the all glass curtain wall and a brick and glass wall system. First an analysis will be done on the existing façade to determine its R-Value. After the R-Value is determined the amount of heat gain through the façade will be calculated. Next different types of glazing and insulation will be researched to find the most efficient and cost effective types to place in the new façade system. The total R-Value of the system will be calculated and then the amount of heat gain through the façade will be determined. The changes to the structural load on the building from the new, heavier brick and glass façade will be also calculated. Finally a cost evaluation will also take place to determine if a brick and glass wall system is less expensive than an all glass system. A look at the schedule consequences of changing the curtain wall system will also be examined.

Expected Outcome:

It is expected that changing from an all glass curtain wall to a brick and glass wall will increase the total R-Value of the wall and will reduce the total heating load on the building. It is also expected that the costs of such a system will be lower without detracting from the overall goals of the owner. Currently the schedule impacts are completely unknown but at a best guess it is expected that the schedule should remain about the same.

Course Reference:

Arch 441 – Architectural Design Analysis
AE 310 – HVAC Fundamentals
AE 372 – Introduction to the Building Industry
AE 475 – Building Construction Engineering 1
AE 542 – Building Enclosure Science & Design

Analysis 3 – HVAC Redesign

Background:

The current mechanical system consists of two air handling units (AHU'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 million.

Opportunity for Improvement:

The current mechanical system is the most expensive line item on the Thames St. 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 AHU'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

Analysis 4 – Effects of Contractor Change

Background:

The original construction management firm Struever Bros. Eccles & Rouse was forced to give up their rights and responsibilities as CM for the Thames St. Wharf Office Building on May 1, 2009 transferring responsibility to Armada Hoffler Construction. This has caused payment issues for the owner and certain subcontractors, scheduling issues during the transfer of CM's and altogether confusion on-site. This issue is also important as a critical industry issue considering the current economic climate and the high likely hood that other firms, both CM and subcontractors, will be unable to complete work that they have been contracted for.

Opportunity for Improvement:

The area for improvement isn't to prevent firms from failing in the future or ensuring that it doesn't happen on a particular project but rather how to overcome the challenges that arise after a firm fails. For the Thames St. Wharf Project certain subcontractors are still waiting for payment on work that was completed months ago. This is unacceptable and causes unnecessary issues concerning expenses for the owner and on-site work issues for the current CM. If a subcontractor is concerned with payment for past work while they are still expected to continue working tensions can arise. Another issue stems from the need to find a new contractor to complete the work. Fortunately for the Thames St. Wharf Project the need to find a new CM was evident well before it happened and preparations were able to be made. In some instances, especially with smaller subcontractors, a firm may all of a sudden unable to keep working causing a break in work on-site. Ways to reduce cost and schedule impacts from a subcontractor failure of that nature need to be examined.

Potential Solution:

A potential solution to lessen the impacts of a CM or subcontractor failure is to constantly monitor the financial stability of a firm that is contracted to complete the work. It also helps to keep a close relationship with firms in each discipline that can possibly step in and help during a time of need. For example with the Thames St. Project H&S properties had a strong working relationship with Armada Hoffler which made it easier for H&S to find a replacement CM on such short notice. Other solutions will also likely emerge as more research is done.

Research/Analysis:

A major part of the research for this analysis will be to contact and interview industry personnel that have worked on a project where a subcontractor or CM has defaulted. The first method of finding contacts will be to use the thesis discussion board and ask industry members on the panel if they have been on a project or know of anyone that has been on a project that has had a contractor change. The second method to find contacts will be to ask contacts that have been made for other reasons and professors if they know of people that will be able and willing to help. After making contacts and

interviewing them the effects of the contractor default and the way those issues were handled will be examined. From the multiple sources the best solutions to the issues presented by industry personnel will be examined more closely. If any trends emerge from the ways that defaults are handled they will be examined to determine why that trend emerge and how effective that method is.

Expected Outcome:

This should be an interesting topic to research considering the importance it will likely have in the future. It is expected that at least ten industry personnel that have worked on projects that have had issues with firms defaulting will be able to be contacted and interviewed for this analysis.

Course Reference:

AE 472: Building Construction Planning and Management
AE 473: Building Construction Management & Contracting

Weight Matrix & Time Table

Weight Matrix					
Description	**Research**	**Value Engineering**	**Constructability Review**	**Schedule Reduction**	**Total**
Analysis 1 – IPDM	15			10	25
Analysis 2 – Façade Redesign	5	10	10		25
Analysis 3 – HVAC System Redesign	5	15	10	10	40
Analysis 4 – Effects of Contractor Change	5			5	10
Total	30	25	20	25	**100**

Chris Bell
Construction Management

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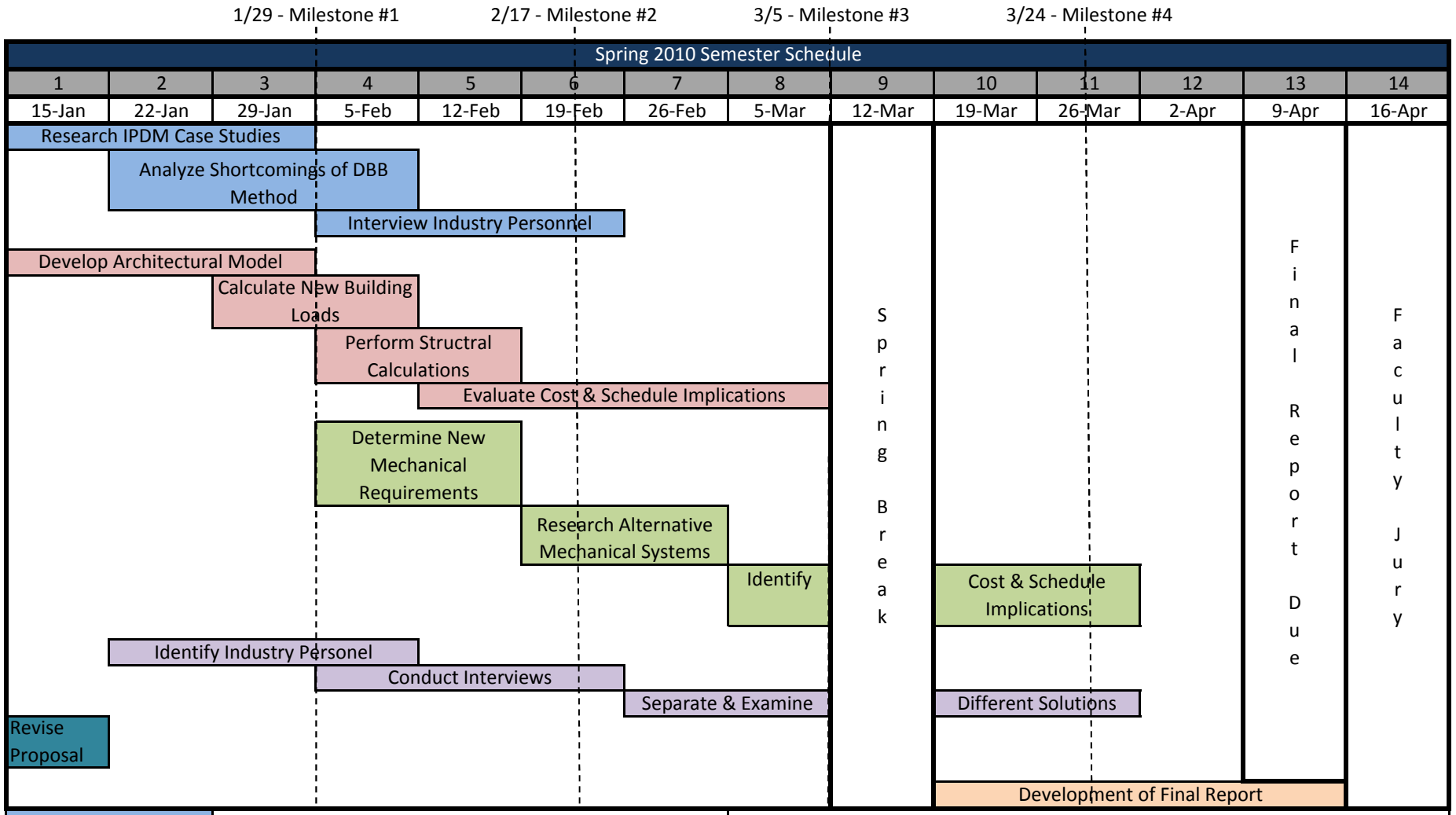
1/15/2010
Consultant: Jim Faust



Analysis One:	Project Delivery Method - Includes MAE Requirements
Analysis Two:	Façade Redesign - Includes Architectural Breadth Study
Analysis Three:	HVAC System Redesign - Includes Mechanical Breadth
Analysis Four:	Effects of Contractor Change

Milestone Tasks

M #1 - Complete IPDM case study research, Complete architecural model

M #2 - Complete Analysis #1, Complete building load calculations, Determine new mechanical requirements, Identify & interview industry personel for Analysis #4

M #3 - Complete Analysis #2, Research alternative mechanical systems

M #4 - Complete Analyses #3 & #4

Appendix 1 – Breadth Studies & MAE Requirement

Breadth One – Architectural

Using Revit the southern façade of the building will be redesigned to incorporate brick and glass. The new façade will be created to match the façades of the building that are currently brick and glass. It will also be designed to match the look of the Bond St. Wharf building located one block to the East of the Thames St. Wharf Building. The effects of the new façade on the heating and cooling loads will also be taken into consideration and are a large portion of the reason behind the redesign. Cost and schedule issues of changing a portion of the building façade will also be examined.

Breadth Two – Mechanical

Following the redesign of the southern façade it is expected that the heating and cooling loads on the building will change and the mechanical system will able to be redesigned to reduce its total cost. The mechanical breadth study will include both the thermal calculations of the new façade system and of the requirements of a new mechanical system. The initial cost and constructability of the new mechanical system will also be examined.

MAE Requirement

To satisfy the MAE requirement knowledge learned from two 500-level classes will be demonstrated. Analysis one will require items learned in AE 572 - Project Development and Delivery Planning. In 572 multiple different types of delivery methods, as well as their benefits and drawbacks were studied. Additionally for analysis two and the architectural breadth AE 542 – Building Enclosure Science & Design will be needed. During that course it is expected that information regarding effective wall systems will be discussed.