Thesis Proposal

Lafayette Tower
Washington, DC

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Table of Contents

Executive Summary

This proposal serves as an outline for the specific issues that I plan on researching and analyzing during the spring semester pertaining to 801 17th Street NW, Washington DC, the site of Lafayette Tower. After a brief background on the project, three topic areas will be explored include the addition of solar trackers, an evaluation of demolishing the existing foundation and foundation walls, and a critique of the buildings column-free perimeters.

Analysis I - *Solar Trackers*

This analysis will look the affects of incorporating Solar Trackers into the building systems in an effort to make the building more sustainable. With one of today's critical construction issues being energy and the economy, incorporating solar power into the design of a building addresses both. Solar Trackers with not only reduce the life cycle costs of Lafayette Tower but also make it more sustainable which is important with the nations push for going green.

Analysis II - *Demolition of the Existing Foundation*

This analysis will question whether salvaging the existing foundation and foundation walls were the correct choice on three levels: cost, schedule, and constructability. Lafayette Tower sits on the old site of the FDIC. When demolishing the old building, extensive planning, bracing, and coordination were needed in order to salvage the existing foundations. I plan on analyzing whether or not demolishing the entire existing structure would have been more beneficial then the course taken. This analysis will give me a much greater understanding of sub-grade structural systems as well as excavation and excavation support techniques which will be very valuable to me as a soon to be construction manager.

Analysis III - *Column-Free Perimeter*

This analysis will assess the actual value of having column-free perimeters on three sides of the building, compared to including them on only one side, and determine which brings more value to the project with the big picture in mind. I feel that this architectural feature was overused in unnecessary areas and therefore cost the project time and money that could have been used elsewhere. This analysis will somewhat subjective but I plan on remaining as unbiased as possible throughout so that a concrete solution can be reached.

The weight matrix shows an approximation of how much time and energy will be placed on the core areas of investigation: critical industry issues research, value engineering, constructability, and schedule reduction. Along with the weight matrix, a time table represents how my thesis will progress over the course of the semester. It will provide dead lines prevent procrastination and keep me from falling behind in a much less structured spring semester.

Background

Lafayette Tower is an 11 story core & shell office building in downtown Washington, DC owned by Louis Dreyfus Property Group. The design team consists of design architect, Kevin Roche John Dinkeloo & Associates, LLC, structural engineer, Tadjer Cohen Edelson & Associates, Inc. and MEP engineers, TOLK, Inc.

The project includes demolition of the Existing building that housed the FDIC Headquarters. Demolition began in August 2006 under an early start agreement and was completed in August 2007. The existing foundations and foundation walls were salvaged and support three tiers of rakers and tiebacks during demolition. The project team utilized a 3D scale model to plan the exact placement of the rakers and corner bracing to minimize the number of conflicts in the demolition of the existing and construction of the new structure. Construction of the new building started in August 2007 and will be completed in December 2008.

Lafayette Tower is designed to LEED Gold standard and will comprise 327,688 square feet of mixed use space, with eh ground floor dedicated to retail. The combination of column-free perimeter and floor-to-floor glass curtain wall skin will offer spectacular views of the city specifically The White House and The Washington Monument. Lastly, the penthouse level will have a green roof terrace and there will be three levels of underground parking available for tenant use.


Figure 1 - Renderings of Lafayette Tower

Analysis Descriptions

Analysis I: Solar Trackers

Problem

With today's economy in a recession and the growing global awareness of green technologies, saving money and the environment is on everyone's mind. As a soon to be construction manager, both topics are of the utmost importance to me and lead me to the question: *what can I do about it*?

Solution

One answer to this question is to do everything in my power to try to incorporate as much sustainable design into my projects as possible. A great way to add sustainable design into Lafayette Tower would be the introduction of photovoltaic panels or more specifically Solar Trackers into the current building systems in order to utilize one of nature's greatest energy sources, the sun. Solar Trackers take the energy collect technologies of PV panels and place them on an array which "tracks" the sun across the sky to prolong the amount of time and efficiency of the energy collection.

The penthouse roof would be an ideal location for the implementation of Solar Trackers which would lower the buildings energy costs in the future and make the building more sustainable as a whole.

Methodology

This analysis would have to be very in-depth to determine an estimate of the potential benefits that the system could bring to the building. Additional structural loads, equipment and installation cost, availability of local contractors who have had experience with this type of system, coordination between the trackers and the existing electrical system, D.C. height restrictions, federal reimbursement for incorporating solar design, and the payback period for the entire system would all have to be considered.

The first step in my research would to determine if Solar Trackers placed on the penthouse roof would meet height restrictions in D.C. It they don't, the analysis would have to be adjusted to meet regulations. New locations on the building or using PVs not on trackers are two things that could be considered. After the location and type of system being used is determined, the next thing to analyze would be if the current structural system can support the weight of the system. If not, modifications to the current system would need to designed and analyzed for cost, constructability and schedule impacts.

Once those items are addressed, the only critical issues left would be to research the cost implications of other items mentioned above and weigh them against the potential financial (both energy costs and federal incentives) and environmental gains the system can obtain and determine if/when it will pay itself off.

Resources

In order to obtain the necessary information, I will rely on both the contacts I have made in the construction industry as well as knowledge gained through my sustainable design class that I plan on taking next semester. Any other needed facts or values will be found through research online or through contacts found from that research.

Concluding Remarks

This topic will be very time consuming in order to pursue it to the extent in which I think is necessary. It will require investigation in both the electrical and structural fields of construction. Therefore, I think it would be a good topic for my depth analysis.

I expect that the final assessment of the incorporation of Solar Trackers will be that they will indeed be worth installing and benefit the building in the long run.

Analysis II: Demolition of the Existing Foundation

Problem

The salvation of the existing foundation and foundation walls was a very time consuming, meticulous, and costly endeavor.

Solution

I think it would be interesting to analyze whether demolishing the entire existing building, as opposed to saving the foundation and foundation walls, would save time and/or money due to the complicated reinforcement that was needed to support the existing foundation during construction.

Methodology

I think it would be interesting to analyze whether demolishing the entire existing building, as opposed to saving the foundation and foundation walls, would save time and/or money due to the complicated reinforcement that was needed to support the existing foundation during construction.

In order to do this, I would need to consult industry professions to determine typical costs and durations for both demolition and excavation of the entire structure with either sheeting and

shoring or some other form of support and for pouring a new foundation/foundation walls. I would also need to consult Clark to obtain the total demolition costs with using tiebacks, corner bracing and rakers and 3D coordination included. It might be wise to consider only what activities happen once the project is below grade in this analysis to make it more specific.

Once I had all that information, I would see how the two styles balance out. A difference in the durations would also lead to a change in General Conditions costs, so that would also be included.

Resources

In order to obtain the necessary information, I will rely on the contacts I have made in the construction industry, knowledge gained through the courses I have taken here at The Pennsylvania State University, and my peers. Any other needed facts or values will be found through research online or through contacts found from that research.

Concluding Remarks

Another aspect of this analysis that could possibly be consider is if LEED points were given for using an existing foundation, would losing them cause the building to drop below a LEED Gold rating. If that's the case, I would look for other places to make the points up (possibly determining what would be gained through the incorporation of the Solar Trackers) and include those impacts on my analysis.

As of right now, I am unable to determine whether or not a complete demolition of the existing structure will benefit the project. At the very least, this analysis will give me a much greater understanding of sub-grade structural systems as well as excavation and excavation support techniques which will be very valuable to me as a new engineer.

Analysis III: Column-Free Perimeters

Problem

The column-free perimeters are an exciting feature to potential tenants because of the increased square footage of window space they provide on the North, West, and South faces of the building but they greatly increase the difficulty of construction due to the incorporation of detailed fall protection plans and cantilevered slabs.

Solution

I agree that the views to the South side of the building are worthwhile due to the fact that they overlook The White House. However, I don't feel the views to the West and North are worthy of the extra time, money and energy needed to incorporate this feature. I would like to analyze the

effects of only incorporating them South face and come to my own conclusion whether or not they are worth including.

Methodology

The dollar value gained from removing this feature will be hard to determine. One of the items I'll have to examine and estimate is the cost differential between the current cantilevered slab to a normal PT slab. Along with that, I will have to ballpark a figure on how much additional time and money was lost due to implementing the atypical fall protection plan. And finally, I will have to determine how the change will affect the $/SF rental price for the building if at all.

Resources

In order to obtain the necessary information, I will rely on the contacts I have made in the construction industry and attempt to obtain $/SF rental costs from with my owner's representative or a realtor. Any other needed facts or values will be found through research online or through contacts found from that research.

Concluding Remarks

I feel that the gains from limiting the column-free perimeter to only the South face of the building will prove to be worthwhile. But also, I recognize that this analysis will be highly subjective. I will do my best to keep this analysis as unbiased as possible in order to determine if this architectural feature should have been included in this project.

Weight Matrix & Time Tables

Description	Research	Value Eng.	Const. Rev.	Sched. Red.	Total
Solar Trackers	25%	20%	5%	0%	50%
Demo Existing Foundation	10%	0%	15%	5%	30%
Column-Free Perimeter	5%	5%	5%	5%	20%
Total	40%	25%	25%	10%	100%

Table 1 - Weight Matrix

January 2009						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7 **WINTER BREAK**	8	9	10
11	12	13 **Research for Solar Trackers**	14	15	16	17
18	19	20 **Evaluate Structural Implications of Solar Trackers / Redesign if Necessary**	21	22	23	24
25	26	27 **Determine Schedule and Constructability Impacts**	28	29	30	31

Table 2 - January Calendar

February 2009						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
	Determine Final Costs and Weigh the Pros/Cons of the System					
8	9	10	11	12	13	14
	Obtain Necessary Information on Foundation Systems from Outside Sources					
15	16	17	18	19	20	21
		Design New Foundation System				
22	23	24	25	26	27	28
		Estimate and Schedule New Foundation System				

Table 3 - February Calendar

March 2009						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
		Compare Existing and New Foundation Systems				
8	9	10	11	12	13	14
			SPRING BREAK			
15	16	17	18	19	20	21
	Obtain Necessary Information on Column-Free Perimeters from Outside Sources					
22	23	24	25	26	27	28
		Analyze and Compare Both Options				
29	30	31				
		Buffer Week for Unexpected Delays				

Table 4 - March Calendar

April 2009						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
			Buffer Week for Unexpected Delays			
5	6	7	8	9	10	11
			Finalize Report and Presentation			
12	13	14	15	16	17	18
			FINAL THESIS PRESENTATIONS			
19	20	21	22	23	24	25
26	27	28	29	30		

Table 5 - April Calendar

The time tables are subject to change depending on the availability of information at any given time.

Conclusions

Lafayette Tower is soon to be one of the most extravagant office buildings located in the District of Columbia and has already had a lot of value added into it by the General Contractor, Clark Construction, but I feel there are still some areas that could be changed to increase the value of the building as a whole. The three areas continually mentioned above, the addition of solar trackers, an evaluation of demolishing the existing foundation and foundation walls, and a critique of the buildings column-free perimeters, are items that I believe may have potential to bring more to this project.

The Solar Trackers will have a greater upfront cost but they will pay themselves off over time with the energy savings along with the federal incentives. The other two do not necessarily add value to the project but have potential to reduce costs, save time on the schedule, and aid in the constructability of the project. This will allow the owner to either take back the extra savings, put the extra resources back into the project in an effort to receive a better final product, or a little bit of both.

I am very happy with the topics I've chosen because I not only find all three interesting and have a desire to investigate them further but think that the knowledge I will gain through their detailed dissection will be extremely valuable as a soon to be member of the construction industry.

Appendix 1 – Breadth Studies

Breadth I- Solar Trackers

With today's economy in a recession and the growing global awareness of green technologies, saving money and the environment is on everyone's mind, the addition of PV systems like a great addition to almost every building. More specifically, I would like to integrate Solar Trackers into Lafayette Tower which take the energy collect technologies of PV panels and place them on an array which "tracks" the sun across the sky to prolong the amount of time and efficiency of the energy collection. The penthouse roof would be an ideal location for the implementation of Solar Trackers which would lower the buildings energy costs in the future and make the building more sustainable as a whole. This topic will be very time consuming in order to pursue it to the extent in which I think is necessary. It will require investigation in both the electrical and structural fields of construction. Therefore, I think it would be a good topic for my depth analysis.

Breadth II- Demolition of the Existing Foundation

The salvation of the existing foundation and foundation walls was a very time consuming, meticulous, and costly endeavor. Therefore, I think it would be interesting to analyze whether demolishing the entire existing building and constructing Lafayette Tower from scratch would save time and/or money due to the complicated reinforcement that was needed to support the existing foundation during construction. As of right now, I am unable to determine whether or not a complete demolition of the existing structure will benefit the project. At the very least, this analysis will give me a much greater understanding of sub-grade structural systems as well as excavation and excavation support techniques which will be very valuable to me as a new engineer.

Breadth III- Column-Free Perimeters

The column-free perimeters are an exciting feature to potential tenants because of the increased square footage of window space they provide on the North, West, and South faces of the building but they greatly increase the difficulty of construction due to the incorporation of detailed fall protection plans and cantilevered slabs. I feel that the gains from limiting the column-free perimeter to only the South face of the building will prove to be worthwhile. But also, I recognize that this analysis will be highly subjective. I will do my best to keep this analysis as unbiased as possible in order to determine if this architectural feature should have been included in this project.