Lafayette Tower
Washington, DC
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Construction Management

Tech Assignment 3 | Dr. David Riley | 21 November 2008

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Executive Summary

This technical assignment evaluates prospective areas for research and possible improvements of 801 17th Street NW, Washington DC, the site of Lafayette Tower. Included in this report are several examinations of constructability challenges, schedule acceleration scenarios, and value engineering topics. Along with that, there are discussions of how critical industry issues affect the above mentioned items and how these issues could be considered and incorporated to better the project all around.

The constructability challenges section takes an in-depth look at three of the largest challenge that faced the Clark Construction team throughout the construction of the building. With the extremely tight site and neighboring buildings only separated by a slim alley way, demolition of the existing structure caused site management to step out of the box in order to succeed. Column-free perimeters on three of the sides of the building brought about an atypical fall protection plan in order to ensure safety on site. And the third topic discussed in this section is how the buildings close proximity to the White House and other federal buildings affected day-to-day construction. In order for this project to be a success, all three of these issues had to be overcome by the site team.

In the schedule acceleration scenarios section, the areas that pose the greatest risk and potentially offer the most reward for the duration of the project are analyzed in order to determine how each could affect the critical path of the schedule. Both preconstruction scheduling plans as well as specific problems that arose during construction are discussed along with how each item was handled by the GC.

An item that separates the best contractors in the construction industry from the rest of them is how well they can incorporate additional value into their work. In the value engineering section of this report, a few of the GC's major ideas, both items used and not used, to add value to the project are brought to light. Each are evaluated based on the direction the Louis Dreyfus had in mind for Lafayette Tower.

The problem identification section looks at several problematic features of the project that could be pursued further through a detailed analysis of the technical building systems and construction methods. The top four are elaborated on in the Technical Analysis Methods section. The analysis topics chosen were the incorporation of Solar Trackers into the building's electrical system, the demolition of the entire existing structure and its implications on the rest of the project, providing the featured column-free perimeter only on the South face of the building, and adding value to the building by choosing an alternative flooring system for the main lobby, elevator lobbies, and bathrooms. This section shows specifically how each of the selected issues relate to the major topics discussed earlier in the paper as well as which would be affected by the critical issues in today's construction industry.

Constructability Challenges

Demolition of Existing Structure

One of the main concerns of the project was that there was only a 12' alley separating the project from the two existing buildings to the North and a 15' alley separating the project from three adjacent buildings to the East. This created a very confined site and allowed little room for equipment to move around the site. The demolition of the existing structure was broken up into two distinct sequences. The first of which removed the non-structural elements of the existing building and the second of which coming back through the building and taking out the structural elements.

In order to keep the job as safe as possible, Clark maintained constant communication with the demolition subcontractor and the neighboring building owners so that all parties involved were aware of the hazards and changing conditions as the schedule progressed. In addition, while the project was still above grade, mesh was put over the building to keep all of the debris inside the barrier. This kept from damaging the surrounding buildings as well as kept the area around the site safe for pedestrians and motorists.

However, once demolition got below grade, things got much more complicated. Tiebacks, corner bracing, and rakers had to be used not only support the existing foundations that were being salvaged as well as hold up the load applied from the additional weight of the nearby buildings. This caused for a series of start/stop activities early on in the project that played a key role in the project staying on schedule. In order to best manage this process, Clark devised a 3D model of the site that showed every scenario as the existing building was being demolished, the supports were being installed, and even as the new building came up out of the hole. The model was a great success and allowed for smooth transitions during this phase of the project.

Figure 1 - Lafayette Tower during demolition of the existing structure

Elevated Deck Fall Protection

One of the exciting features for future tenants of Lafayette Tower is the column-free perimeters along the feature walls (17th and H Street) which will allow for great views of the surrounding areas to the North, West and South. The drawback of a column-free perimeter is that it presents an atypical fall protection situation since a perimeter handrail has nothing from which to brace. In order to deal with this problem, cables were run through the columns to act as railings and anchors were installed in the columns during the concrete pours.

Two cables were run through all of the exterior columns throughout the entire building. The cables were hung at a height of 42" and 21" to meet OSHA standards and allow for work to happen freely within the cables.

The in-deck anchors were cast into the columns during the concrete pours. Two anchors were placed in each column to accommodate for activities that required more than one person.

Figure 2 - In-deck anchor set in column

Figure 3 - In-deck wall anchor

In order to go outside of the cables, workers had to be wearing full body harnesses and be attached to the anchors with retractable cable fall arresters. This increased the amount of time it took to complete any activity and also caused frustration for the workers as they completed their day-to-day tasks but was a necessary evil to ensure safety which is always the #1 priority.

Proximity to White House and Federal Offices

Lafayette Tower is adjacent to the White House's Lafayette Park and is directly across H St. from the New Executive Office Building which acts as a gate and is the first stop for anything that is intended to enter the White House.

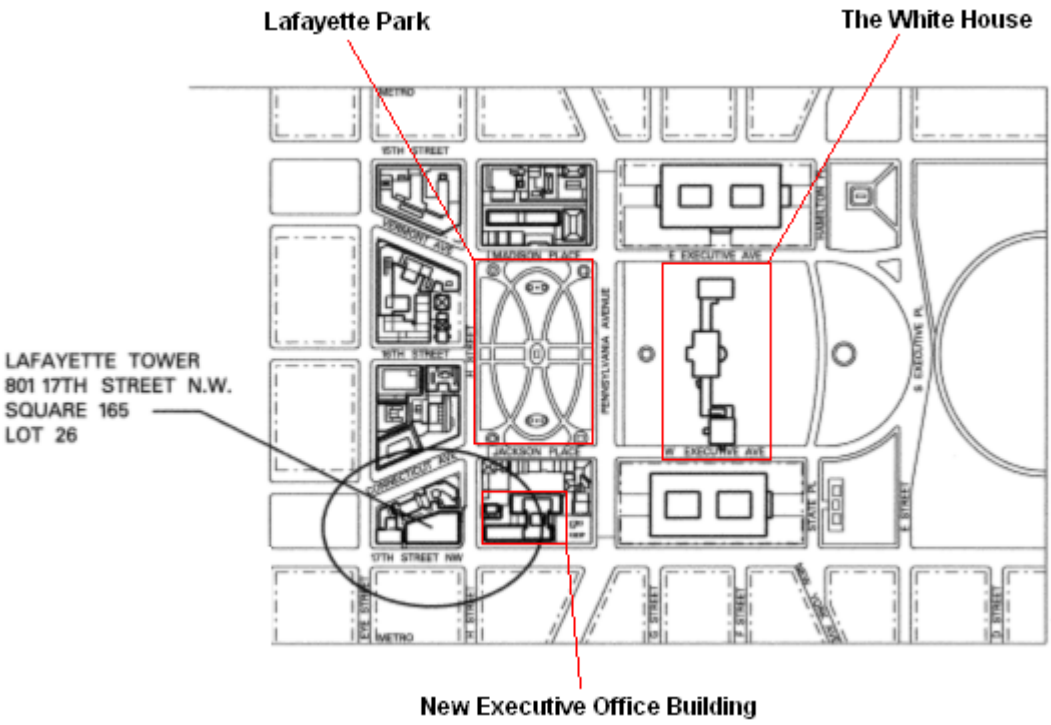

Figure 4 - Map of downtown D.C. showing the relationship between Lafayette Tower and significant government properties

In addition to the building's shear proximity to the White House, both 17th and H St. are main thoroughfares for motorcade traffic entering the White House which brought upon its own set of challenges. All of these factors made it pertinent that regular communications were held between Clark and the United State's Secret Service.

Lane closures for off-hour work, all crane usage, and large deliveries, particularly on H St., were a few of the big issues that had to be addressed with the Secret Service well in advance. Crane usage near the time when the motorcade would be coming by was explicitly restricted. The crane was required to remain still from 30 minutes prior to when the motorcade would be passing until it had safely reached the White House. If this order was disobeyed, a member of the Secret Service informed the Clark team that, "two rockets would be fired. The first of which would enter the cabin of the crane and the second would find its way to Clark's site trailer."

At points throughout the project, the schedule was at the mercy of the Secret Service who dictated when construction could and could not continue. This is something that Clark knew would be an issue beforehand and the team did their best to make sure progress was made when possible and not when national security was an issue.

Schedule Acceleration Scenarios

The critical path of the project begins with the demolition of the existing structure starting with the non-structural elements of the building then moving to the structural elements. Once the demolition got below grade, three tiers of tiebacks, corner bracing, and rakers were used to help support the existing exterior walls that would be used for the new building.

After the old building was completely demolished and removed, except for the foundation and foundation walls, the critical path moved to the concrete as it came out of the hole and continued up until it topped out. Then it proceeded to the curtain wall and the roof to get the building watertight. Elevators were the next item affecting the critical path followed by the completion of finishes in the lobby. And finally the last part was the commissioning of all the mechanical equipment.

As is true for every construction project, there are always risks that could greatly impact the schedule. Classically, the biggest issues for a project similar to Lafayette Tower are items such as demolition and excavation, concrete and the curtain wall. Along with the items that can be controlled by the contractor, there are outside forces that can affect the project. Weather is always a concern especially before the building is watertight and with the project being so close to the White House, the schedule is at the mercy of the Secret Service.

Specifically, the issues that ending up affecting the schedule of this project most were the fabrication and installation of the curtain wall and the commissioning of the mechanical system. For each of these problems, Clark was not the guilty party and the subcontractors were at fault.

In the midst of the project, the curtain wall subcontractor was bought out by a larger company and fabrication order/speed became altered from what was originally intended. When the wrong pieces started showing up on site, the progression of the curtain wall greatly slowed. The solution that was devised between Clark and the curtain wall subcontractor was to start getting the pieces on site as soon as possible and increase the labor force to compensate for initially falling behind. But even after the new plan was put in place, the curtain wall did not finish on time which led to a delay in the building being water tight.

In order to adjust for this, Clark analyzed the use of mold resistant drywall so that the schedule could continue as planned. The cost difference was about $0.12/SF which totaled around $70,000 all said and done. The change was approved and tardiness of curtain wall completion had minimal effects on the project.

Commissioning was delayed due to the fact that permanent power to the building came 3 months later than expect. Originally, PEPCO had planned to have permanent power by July but unfortunately they were not able to supply power until October. This posed a significant challenged because turnover was a mere 3 months away when the commissioning process finally began. Clark's solution was to again increase the labor force in order to compensate.

Currently, they are unaware if this problem will cause the project to finish late but fortunately for them, cost and quality are much greater concerns to the owner as the current state of the economy is making finding tenants a difficult task.

According to the project manager, the areas that had the greatest potential for schedule acceleration were the demolition and excavation. The reason for this is because early on in the project there are still few trades on site. This leads to two reasons why acceleration would be better at that time. First, there is less site congestion which will allow you to bring more people on without affecting the work of others. And second, you will be getting more for your money. With less people on site, you will pay less in overtime fees to get the same decrease in duration then later on when numbers have grown. The costs to implement this plan would just be the labor costs for having more men working or having similar crew sizes but with the men work overtime.

Value Engineering Topics

Value Engineering is something that Clark Construction takes great pride in because they feel that it sets them apart from other contractors. Even though Clark was brought into the project when the design was nearing completion, they still invested a lot of time and money in investigating possible value engineering ideas for the owner to incorporate. The key areas that they attacked were the finishes, waterproofing, and the mechanical and electrical systems.

Before any specific items are addresses, it is important to understand the image of what this building is to become to the owner. Louis Dreyfus wanted Lafayette Tower to set a benchmark for other high end office buildings in downtown D.C. They are renting the space for one of the highest $/SF value in D.C. history and because of this, they are expecting a product that reflects how much money people will be spending to occupy the space. Lafayette Tower is being classified as a “trophy office building.”

That being said, finishes, the item that will stand out to anyone who attempts to incorporate more value into the project, were almost entirely off limits. The only item of significant value that the owner would budge on was the wall finishes in the bathrooms. By switching from wood veneer panels to painted drywall, Clark saved the owner over $150,000. Extravagant flooring in the main lobby, elevator lobbies, and bathrooms and a trellis on the roof were a couple of the big ticket items that Louis Dreyfus refused to compromise on. The roof trellis alone would have saved them in the neighborhood of $250,000.

In terms of waterproofing, a few of the areas, particularly throughout the below grade floors and parking garage, were specified to have higher quality water proofing than what was really needed. After the corrections were made, an estimated $130,000 was saved.

Mechanical and electrical systems were evaluated two separate ways. The first was to analyze all the separate components and determine where addition value could be attained. This method was not used but played a role in the second evaluation which looked at buying out the systems as packaged units. By procuring packaged units, they were able to obtain discounts from the venders which resulted in savings of over $100,000 for the electrical system and almost half a million dollars for the mechanical system.

Problem Identification

After being on this project for 3 months this summer and reviewing its documents, schedules, estimates, construction methods, and personnel for another 3 months during the semester, I feel that there is nothing that stands out as huge problems in terms of the way Clark Construction handled things. That being said, in my opinion the best way to improve this project is to look at the greatest successes of the project, cross them off the list, and focus on the items that I'd consider to be merely adequate.

The items that I feel are exceptional or unnecessary to analyze/improve are as follows:

- Structural system
- Upgrading from LEED Gold to LEED Platinum
- Components and installation plan of the curtain wall system
- Schedule/Sequencing
- Project staffing
- General Conditions estimate
- Site layout
- Building systems
- Project delivery method

With all of those issues taken out of play, very few broad topics are left to be analyzed. After much thought and consideration these are the possible issues that I'd consider to be good to analyze:

- Demolishing the entire existing structure and constructing an all new foundation instead of salvaging the existing foundation and foundation walls
- Replacing the expensive Italian marble flooring in the lobbies and bathrooms with a cheaper alternative
- Incorporating the column-free perimeter only on the south side of the building
- Utilizing Solar Trackers on the penthouse roof to reduce life cycle costs and make the building more sustainable
- Designing a less expensive alternative to the roof trellis that would still function similarly and be aesthetically pleasing
- Changing the elevator design (evaluating cost and schedule implications of not having all of the main elevators ascend the entire building)
- Look at the effects (both positive and negative) of using minority subcontractors
- Applying more 3D modeling (BIM) to the project

Technical Analysis Methods

Analysis Topic	Critical Issues	Constructability	Schedule Acceleration	Value Engineering
Solar Trackers	✓			✓
Demo Existing Foundation		✓	✓	
Column-Free Perimeter		✓	✓	✓
New Flooring	✓			✓

Solar Trackers

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

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. A new location 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 and environmental gains the system can obtain and determine if/when it will pay itself off.

Demolition of the Existing Foundation

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.

Another factor to consider is if LEED points were given for using an existing foundation and if they were, 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 and include those impacts on my analysis.

Column-Free Perimeter

The column-free perimeters are an exciting feature to potential tenants because of the increased square footage of window space they provide. I agree that the views to the South are worthwhile but 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.

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 discussed in the constructability challenges section. And finally, I will have to determine how the change will affect the $/SF rental price for the building if at all.

Value Engineer the Flooring in the Lobbies

As a trophy office building in D.C., high-end finishes are a necessity. But after seeing the product up close, I feel that the tile could be substituted with a different flooring system that would provide similar aesthetic value but be attained at a substantially lower cost to the owner.

First and foremost, a comparable replacement would need to be found. I would need to discuss potential options with industry professions to find out what they have learned from their experiences and do my own product research, either by searching online or contacting venders. Cost for the materials, transportation and installation for both the current marble and the new product would all be considered along with lead times associated with both although I anticipate that schedule will not play a critical role in my decision.