



## **Final Proposal for Spring Thesis Project**

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**Aloft & Element Hotels at Arundel Mills**

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## 4.1 Executive Summary

The following report introduces the Aloft and Element Project at Arundel Mills and discusses some basic information specific to the project. The report goes on to identify several proposed topics that will be analyzed during the next semester of study at Penn State. The topics that will potentially be analyzed in the future are listed below.

- The Effects of BIM on the Quality of Construction Documents
- PTAC Units in Lieu of a Forced Air System
- Prefabrication of Guest Bathrooms
- Short Interval Production Schedule (SIPS)

Each topic includes an outline of a statement to identify the problem, the goal of examining the analysis topic, the steps that will be taken to achieve the goal stated, and the expected outcome of the analysis. The report then continues on to illustrate how time will be distributed throughout the next semester. The appendix at the end of the report then lists the topics outside of the construction field that will be analyzed.

## 4.2 Introduction

The Aloft and Element hotels are a new brand of hotels specific to Starwood Hotels and Resorts Worldwide. The Aloft & Element Hotel project will be located across from the Arundel Mills Mall in Anne Arundel County, which is in close proximity to the Baltimore-Washington International Airport. The project entails the construction of two seven-story hotels, as well as, a two story parking structure. The Aloft hotel is a vision of W Hotels and includes 142 guestrooms. The Element hotel is an extended stay hotel and consists of 147 guestrooms. The hotels' designers have taken a stab at sustainability by incorporating a few building components typical to green design. The project team, however, will not attempt to obtain a LEED rating.

The owner of the Aloft & Element Hotel Project at Arundel Mills, LTD Management, LLC, is no stranger to construction. With the addition of several new hotel properties to its assets, LTD plans to expand its revenue to nearly \$1 billion. The addition of the Aloft & Element Hotels will consequently assist them in achieving their goal.

LTD has recently had an extensive list of hotel projects were they have assumed the owner's role. Previously, LTD had brought Whiting-Turner (WT) on board as the construction manager at risk for a hotel project in Fredrick, Maryland. The key to WT landing the Aloft & Element project was WT's mission to treat LTD fairly throughout the previous project, specifically with regards to change orders. As was also the case with the project in Fredrick, LTD has strived to reduce the costs of the Aloft & Element projects with several rounds of value engineering. In order to satisfy LTD, Whiting-Turner had made it their mission to cut costs, keep to a tight schedule, and coordinate with LTD's FF&E installation.

During a summer internship with Whiting-Turner, I was quickly tasked with the responsibility of a quality check of the construction documents for the Aloft & Element project. Soon after I began to realize that the documents provided by the design team were sub-standard to the industry. The number of RFI's that were being sent to the designer, and the additional amount of work that the poor quality of the documents caused, lead me to become interested in how the situation could be avoided all together. Implementing BIM on a project appears to be an excellent solution to the problem of poor construction documents.

Also, during my internship, it became prevalent after a budget was submitted to the owner, that the Aloft & Element project was extremely over their budget. Whiting-Turner shortly thereafter began a round of value engineering on the project. Before I left for the summer, it was suggested that designers change the HVAC system from forced are to PTAC units. The idea interested me and caused me to explore the implications of such a change.

The annual PACE roundtable event of 2007 discussed prefabrication as a critical issue facing the industry today. Because LTD Management, LLC initially desired a 12-month schedule, I decided to explore the used of prefabrication on the Aloft & Element project, particularly with respect to the repetitive guest bathroom units. LTD's wish for a shorter schedule also caused me to investigate the implementation of a SIPS schedule in order to reduce the actual 16-month schedule down to a more desirable timeline.

## 4.3 Analysis 1 – The Effects of BIM on the Quality of Construction Documents

### **A. Problem Statement**

As the construction industry grows and buildings become more complex, architects and design engineers are often assigned more and more responsibility. The result is often poor construction documents that frequently hinder the construction process and affect the quality of a finished building.

### **B. Goal**

Throughout the next few months of research, I look forward to develop an understanding of the impact of poor construction documents and the root causes of such documents. During previous internships, I acquired insight into the consequences of poor construction documents both during preconstruction and construction phases. It is my goal to first look at the effects on the construction team, the owner, and ultimately the quality of the finished building. Once I have examined the consequences of subpar documents, I intend to investigate the ways that BIM modeling can positively affect a construction project

### **C. Research Steps**

1. Define the term “poor construction documents”
2. Survey contractors and construction managers and develop an understanding of how often they deal with poor construction documents.
3. Survey contractors and construction managers to develop a list of the major consequences of poor construction documents.
4. Review existing literature.
5. Survey contractors and construction managers that have been a part of projects that have utilized BIM, in order to understand if BIM has affected the quality of construction documents that have been issued.
6. Survey design firms to add to the understanding of how BIM has positively affected the quality of construction documents they issue.
7. Summarize results

### **D. Expected outcome**

This research should identify the significance and frequency of poor construction documents and the negative impacts they cause to a construction project. This research should also identify the ways BIM positively impacts the quality construction documents both from the designer’s and construction team’s point of view.

## 4.4 Analysis 2 – PTAC Units in Lieu of a Forced Air System

### **A. Problem Statement**

The cost of the Aloft & Element hotel project is currently over budget. Much of the project's cost lies in the HVAC system of the Aloft & Element buildings, which accounts for nearly 15% of the overall cost. For the mechanical systems for the Aloft and Element Buildings, each guestroom of the hotels has been designed to include a fan coil unit (FCU), which would give each guest the ability to control the temperature of their room separately. The air would be forced through the spaces of the buildings by three air handling units (AHU's) located on the roof of each hotel. Package Terminal Air Conditioner (PTAC) units may alleviate some of the strain on the budget of the project.

### **B. Goal**

An in depth analysis will take a look at the required PTAC unit for a typical hotel room and the changes in the structural system of the building, particularly at the roof, which is where the air handling units have been placed in the construction drawings. The analysis will also delve into changes on the cost, schedule, and constructability of using the PTAC units in lieu of the specified forced air system.

### **C. Research Steps**

1. Research PTAC units and develop a list of positive and negative issues coinciding with PTAC units.
2. Analyze the heating and cooling load needed for a typical guestroom.
3. Size and choose a PTAC unit.
4. Analyze the need for 3 AHU's to each hotel building.
5. Analyze the structural system of the roof of each hotel when AHU's are eliminated and propose changes.
6. Analyze the effect to the budget by changing to PTAC units and reducing the size/number of the AHU's.
7. Analyze the constructability issues of PTAC units specific to the project. Propose solutions to issues.
8. Analyze the implications to the cost and schedule of the project.
9. Summarize results

### **D. Expected Outcome**

This research should identify the positive impacts to the budget and schedule. It should also identify any issues with constructability and propose possible solutions to such issues. Research in this area should also dismiss the majority of the negative impacts to the quality of the hotel buildings.

## 4.5 Analysis 3 – Prefabrication of Guest Bathrooms

### **A. Problem Statement**

The owner of the Aloft & Element Hotels at Arundel Mills had originally hoped for a 12- month schedule; therefore, ways of accelerating the schedule of the project continue to be atop the minds of the construction team. Prefabricating repetitive guest bathroom units may be one way to accelerate the schedule of the project, which would ultimately allow the hotels to generate revenue for the owner at an earlier date.

### **B. Goal**

Aside from the impact to the schedule, the cost of assembling bathroom units off site would carry significant cost implications to the project. Changes to the logistics to the site, including crane size and type, would also occur. For the reasons previously stated, the effects to the budget and construction site logistics would be identified and studied.

### **C. Research Steps**

1. Research the prefabrication of guest bathroom units.
2. Identify and address issues concerning site logistics.
3. Identify necessary changes to crane size.
4. Interview prefabrication contractor(s) to identify implications to cost and schedule.
5. Analyze the impacts to the budget and construction schedule.
6. Summarize results.

### **D. Expected Outcome**

Research in this area should yield positive consequences to the schedule by utilizing prefabrication. Research should also identify and address the negative consequences to the budget and site logistics of the project.

## 4.6 Analysis 4 – Short Interval Production Schedule (SIPS)

### **A. Problem Statement**

Whiting-Turner’s schedule for the Aloft & Element project has been spread over a 16-month period; while, LTD had initially desired a 12-month schedule. Because units and floors of the Aloft and Element building are repetitive, a SIPS schedule may reduce the schedule of the project.

### **B. Goal**

This analysis will explore the positive and negative implications of a SIPS. While the first floor of each hotel is unique from the rest of the building, floors 2-7 are repetitious and generally have the same floor plan; therefore, a SIPS will be suggested for floors 2-7 of both the Aloft and Element buildings. The suggested SIPS schedule should ultimately come closer the desired 12-month schedule.

### **C. Research Steps**

1. Research SIPS and different techniques.
2. Speak with members of the construction industry and get an idea of reasonable durations for activities.
3. Use research to develop zones/areas of the buildings that will be used in a SIPS.
4. Develop a SIPS.
5. Contact former boss and get his input on using a SIPS for the Aloft & Element Project.
6. Identify challenges of implementing SIPS on hotel.
7. Identify solutions to challenges.
8. Summarize results.

### **D. Expected Outcome**

Research and analysis in this area should result in a SIPS schedule that is closer to the 12-month timeline that LTD Management, LLC. had originally desired. This research should also unveil some of the challenges related to implementing a SIPS schedule, particularly on a hotel project. Solutions will be proposed after the challenges are identified.



## 4.7 Weight Matrix

Description	Research	Value Eng.	Const. Rev.	Sched. Red.	Total
Poor Construction Documents and BIM	25%				25%
Forced Air vs. PTAC Units	5%	10%	5%	5%	25%
Prefabrication of Guest Bathrooms	5%	5%	7%	8%	25%
Short Interval Production Schedule (SIPS)	5%			20%	25%
Total	40%	15%	12%	33%	100%

## 4.8 Summary

By studying the topics listed above I hope to become knowledgeable in these specific areas. I hope to be able to apply the knowledge that I acquire throughout a lengthy career. I also expect to continue to improve on communication skills with other members of the construction industry, particularly members of a higher stature. By communicating with members of the industry I look to learn lessons that others have learned through their experience, so that I can apply those lessons to any project that I am involved with in the future.

## **Appendix A. – Breadth Topics**

Below are the proposed ideas that I have for breadth topics which are outside of the construction management field.

### ***Mechanical Breadth***

I will first restore knowledge about designing HVAC systems. I will then analyze the heating and cooling load needed for a typical guestroom. Using this information, I will size a package terminal air conditioning unit (PTAC) unit for a typical guestroom in lieu of the specified forced air system. I will then analyze the sizing/ number of air handling units utilized to heat and cool the Aloft and Element hotel buildings based on the load that will be alleviated by implementing PTAC units.

### ***Structural Breadth***

As a continuation of the mechanical breadth above, I will examine the structural system of the roof of the hotel buildings. By reducing the size/number of three AHU's per hotel, I will alleviate some of the load on the roof of the buildings. I will then suggest a redesign for the structural system of the roof.