Residence Inn

By Marriott

2345 Mill Rd, Alexandria, VA

Julia E. Phillips

Construction Management

Thesis Proposal

Dr. Horman

Residence Inn

By Marriott
2345 Mill Rd, Alexandria, VA
Julia E. Phillips
Construction Management

Table of Contents

Executive Summary

This document is intended to outline the issues I plan to research and improve upon during the spring semester 2008. Four technical issues and one critical industry research area will be explored for possible improvements. Throughout these analysis and research areas I hope to add value to the building by implementing more green technologies and materials, as well as reducing the schedule and cost, and improving the constructability of the project.

Analysis 1: Acoustics

This analysis will focus on improving the acoustics between the outside and inside of the façade as well as between guestrooms. Green materials will be implemented into the improvement of the acoustical system.

Analysis 2: Mechanical System

This analysis will focus on reducing the energy consumption by the fan coil units in the guestrooms that are designed to run 24 hours a day. This re-design also focuses on implementing a greywater system in to the building.

Analysis 3: Structural Design of Underground Garage

This analysis focuses on reducing the schedule and cost of constructing the underground garage by instituting the use of the flat plate pre-cast Filigree structural panels.

Analysis 4: Off-Site Prefabrication

This analysis focuses on reducing the schedule time of the façade and increasing the quality of construction by using off-site prefabrication.

Critical Industry Research: "Greening" of Hotels

This research is intended to help dispel the notion that adding green value to any project costs considerable more money up front. This will be done by using green technologies during my breadth studies and comparing the up front cost, life cycle cost, and energy use of the current system vs. the proposed system.

Proposal Introduction

The Residence Inn by Marriott is located at 2345 Mill Rd. Alexandria, VA. It is conveniently located near many government buildings allowing for long term guests on business to be close to work. The site is very constricted and is defined by the two streets that border the site as well as two metro tracks that cut through the Southwest side of the site. Due the noise created at night from the metro tracks the glazing system in the building is a 1" thick double paned system designed for an STC of 59 which is very high and usually sued for radio and studio booths. The Marriott is owned by Miller Global Properties and operated by Marriott staff. It is a 181 room, 15 story Hotel, post tensioned concrete structure, with 3 levels of underground parking on site. In Alexandria, Virginia, every new building that is designed and built must go through a rigorous approval process. The city must approve the building use, design, façade, exterior penetrations, colors, and each building must have at least 20 LEED points.

Since this project has many unique aspects there are a number of areas that can be analyzed to add improvements to the building. The fan coil units in each guestroom are set to run 24 hours a day. This is due the high sounds levels produced by the metro noise. This provides an area of research in finding better controls and sound attenuation system in the façade to reduce the amount of energy the fan coil units consume and increase the acoustical properties of the façade. While analyzing these areas LEED rated and recycled materials will be investigated to add more value to the building.

Since hotels produce a large amount of greywater everyday this provides another area of research to institute a greywater system into this hotel. This should not add a great deal of design and construction coordination because the building already has an all-water heating and cooling system in place.

The underground structural system also provides an area for improvement because the underground garage is made entirely of cast in place concrete. The project is already behind schedule due to unexpected water issues, if the garage was made of pre-cast Filigree panels there is a possibility for schedule acceleration without taxing the ability of the tradesmen.

Analysis 1: Acoustics

Background & Goal

There are three metro tracks that cross through the site, the closest coming within 30' of the building footprint. The problem that is faced acoustically is sound levels ranging from 100 to 102 dB created from the passing metro trains. Inside the guestrooms there is suppose to be insulation and two layers of drywall, however in attempt to save money some of these materials have been eliminated.

There are a number of possible solutions to these problems. I plan to investigate what materials can be used for insulation and interior sound attenuation that will have the required absorption and possibly count for more LEED credits than originally designed for.

Methods

- Determine current Room Criteria and Noise Criteria.
- Calculate:
  - Absorption and reflection coefficients of interior partition and façade materials
  - Total acoustical absorption/reflection of interior partitions and façade
- Determine required Noise Reduction & Transmission Loss Values for a typical hotel.
- Compare existing to required Transmission Loss values of interior partitions and façade.
- Compare ANSI required Sound Transmission Class values to existing values
- Compare ANSI required Impact Insulation Class values to existing values
- Compare proposed design Room Criteria and Noise Criteria

Resources

- Textbook Architectural Acoustics by Marshall Long
- Architectural Engineering Faculty
- ANSI Code

Expected Outcome

- Increase sound attenuation from the metro tracks through the façade.
- Decrease sound transmission between guestrooms
- Add value to the building by using recycled and LEED rated materials.

Analysis 2: Mechanical System

Background & Goal

The mechanical system is designed to condition the guest rooms and other spaces as well as masking the noise from the metro tracks. The mechanical fan coil units are designed to run 24 hours a day to create a white noise background. The hotel also generates a large amount of greywater that is currently being expelled through the storm water system.

The goal of this analysis is to re-design the controls for the guestroom mechanical units to be more user oriented during the day and have an automatic override at night to mask the metro noise. A greywater system will be instituted to recycle more water and achieve more LEED credits.

Methods

- Search for Energy Star controls or fan coil units for the guestrooms.
- Consult with the mechanical designer, Curt Eisenhower at Southland Industries, to gain better knowledge about implementing a greywater system and unit controls.
- Consult with the mechanical option faculty to aid in the design of the greywater system.
- Re-design the all water system to reuse the greywater for toilet flushing and air handling units.
- Compare energy use and life cycle cost of the guestroom fan coil units of the existing system to the proposed controls.
- Compare water efficiency of the current system to the proposed greywater system.
- Analyze the constructability of the greywater system.
- Analyze the possibility of any schedule reduction.

Resources

- Southland Industries
- Mechanical option faculty
- Mechanical Reference Textbook

Expected Outcome

- Added value to the building by reducing energy and water usage and applying these technologies to LEED credits.
- A better system for a similar cost in value engineering.

Analysis 3: Structural Design of Underground Garage

Background

The underground garage is entirely constructed of cast in place concrete. This was designed to minimize the floor depth to be able to help maximize the total number of floors in the building. The water problems associated with excavation pushed the project behind schedule. The added time for curing of the cast in place concrete only slowed the project more.

Goal

The goal of the re-design is to try to maintain the minimal floor depth while accelerating the construction sequence using the flat plate pre-cast Filigree panels.

Methods

- Analyze current design loads, spans, and column spacing.
- Contact Filigree manufacturer for design charts and consulting in help with the re-design.
- Contact site staff for crane charts to ensure crane size is big enough for the panels.
- Analyze constructability of Filigree system vs. cast in place.
- Calculate schedule reduction for Filigree system.
- Calculate any cost savings.

Resources

- Structural Engineering Faculty
- Filigree Manufacturer website and contact
- Balfour Beatty on-site staff

Expected Outcome

- An increase in efficiency during the construction of the underground garage.
- A reduction in schedule time.
- A possible reduction in material cost and construction cost.

Analysis 4: Off-Site Prefabrication

Background & Goal

The glazing system is very sensitive construction since it is within the façade that contains many materials. Off-site prefabrication will address the constructability issues associated with the façade and glazing system. The off-site prefabrication is intended to reduce construction problems with the window flashing and sealant. Façade materials will also be addressed for LEED materials and reflective qualities to enhance the sound attenuation of the building from the outside and increase the value engineering.

Methods

- Contact local warehouses near the site for rentable area for prefabrication
- Analyze crane costs for more picks for the façade vs. cost of masons.
- Analyze the schedule duration for the current façade system vs. the prefabricated façade panels.
- Analyze the cost for each schedule duration and crane use during construction of the façade.

Resources

- Construction option Engineering Faculty
- Balfour Beatty on-site staff
- Architect
- Trade foreman and project managers

Expected Outcome

- Increased construction efficiency in the prefabrication warehouse and on site vs. all on site construction.
- A reduction in on site scheduled construction time.
- Cost savings.

Critical Industry Research: "Greening" of Hotels

Background & Goal

There is still the persistent idea that going green or achieving LEED simply costs too much no matter what the benefits could be. While budgeting for this project it was determined to only do what would qualify for only the required 20 points because of this idea of green technologies costing too much money.

The goal of this research show owners that with pre-planning what green technologies to implement and which LEED credits are viable to try to achieve it can be done with out adding any up front cost to the project.

Methods

- Comparing life cycle costs of the current interior finishes to the "green" interior finishes.
- Comparing energy use of the current guestroom mechanical units to the newly controlled units.
- Comparing the water use of the current system to the new greywater system.
- Comparing the up front costs of the current interior finishes and mechanical system to the new green finishes and systems.
- Communicate findings to the owner to determine if the opinion about LEED would have been different with more information at the beginning of the design process.

Resources

- Construction option faculty
- Project staff and consultants
- LEED database
- Material manufacturer's websites
    - www.greenbuildingpages.com
    - www.buildinggreen.com

Expected Outcome

- Through these tasks I will be able to show that green building technologies are:
    - not more expensive up front
    - have a longer life cycle cost
    - increase energy and water efficiency
- I also plan to show what LEED points would have been earned with a small amount of pre-planning.

Proposal Summary

In conclusion some key ideas that I want to be able to take away from my research include:

- Critical thinking skills
- Ability to add value in a re-design problem
- Ability to "think outside the box" when it comes to schedule acceleration and construction techniques
- A better understanding of the LEED system and documentation
- Better communication skills, such as communicating ideas for using green technologies
- A better understanding of why green technologies and LEED is so important

These skills will help me greatly in the work force. I will be able to research ideas or problems and find creative valuable ways to solve them and communicate them effectively.

Weight Matrix

The table below shows a breakdown of how each analysis area will be weighted into the grading system and directly correlates to the efforts put forth while researching these areas for my senior thesis.

Description	***Research: Going "Green"***	***Value Engineering***	***Constructability Review***	***Schedule Reduction***	***Total***
Acoustics	*20%*	*5%*	*5%*	*5%*	***35%***
Mechanical	*10%*	*15%*	*5%*		***30%***
Structural			*5%*	*15%*	***20%***
Pre-fabrication		*5%*	*5%*	*5%*	***15%***
Total	***30%***	***25%***	***20%***	***25%***	***100%***