

UNITED STATES
DEPARTMENT OF THE INTERIOR
CAFETERIA
MODERNIZATION



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DEPARTMENT OF THE
INTERIOR CAFETERIA
MODERNIZATION

1849 C STREET NW,
WASHINGTON D.C.

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THESIS PROPOSAL

INTRODUCTION

The Department of the Interior building is located at 1849 C Street Northwest in Washington D.C.. It was constructed in 1936 under the New Deal, and featured some of the most state of the art features in the building industry, such as air conditioning and fire protection. In the mid 90's, plans for the modernization of the Department of the Interior building began coming into discussion. In 2001, Grunley Construction Company was awarded the contract to the modernization of Wing 6. The contract for the modernization of each additional wing has been added as an amendment or "Option" to the original contract. The cafeteria for the Department of the Interior is located on the basement level of Wing 3 and Wing 4. It has been contracted as a change order for the modernization of Wing 3.



The Department of Interior Cafeteria Modernization project began construction February 6, 2009. The cafeteria project included the renovation of a multiple spaces all for the purpose of providing the Department of Interior and it's employees with upgrade facilities for their day to day work. The project renovation scope includes a dining area, post office, Interior Department Recreation Association Office, credit union, two conference rooms, a barber shop, kitchen area, servery area, locker room, 3 walk in coolers, mechanical room, electrical room and elevator. Renovations to the building's structure (steel frame encased in concrete) would include a new skylight system for the dining area, and slab replacement in the kitchen. The original schedule had called for completion in March of 2010, but did not actually occur until July 29th.

Just as with the schedule, the original estimate did not come in on budget either. The original proposal from the general contractor came to \$7,888,275. Although the final cost are still being comprised, the actual cost is predicted to be between \$9 Million to \$11 Million dollars.. The cafeteria modernization was given notice to proceed with a Price to be Determined Later (PDL) agreement. Upon completion, all parties will have a meeting to sort out who is responsible to pay for areas where the project went over budget. Although time and money may have exceeded expected values, all parties were satisfied with their final product. On August 4, 2010, a grand opening was held where cafeteria modernization had received rave reviews by the Department of Interior employees.

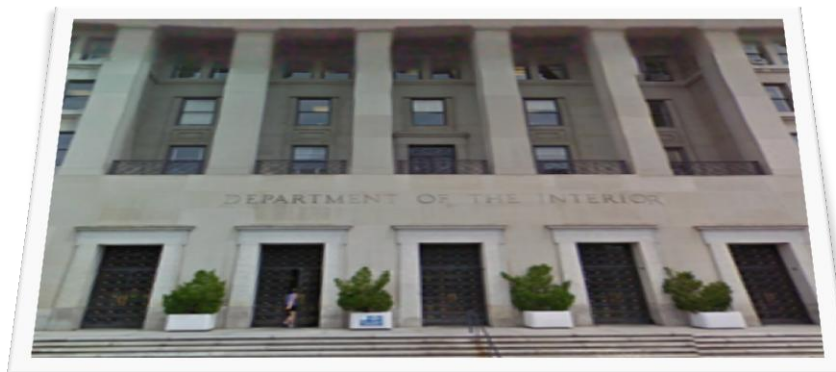


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EXECUTIVE SUMMARY

This Thesis Proposal serves a plan for the research and analyses that will be performed on the Department of Interior Cafeteria Modernization Project. The core of this investigation will evaluate critical industry issues, value engineering decisions, reviews of constructability, and opportunities to reduce the project schedule. The four analyses are as followed:

Technical Analysis I *Critical Industry Issue: High Performance Buildings*

This analysis will review the shortcomings in the design, construction, and maintenance of High Performance Buildings. Specifically, it will focus on areas in the cafeteria project where the high performance design was not maintained either through errors in construction or lack of knowledge in maintenance.

Technical Analysis II *Using Tablet PCs for Quality Control*

Analysis II will research the use of Tablet PCs in the field to coordinate with construction activities. By being able to access the BIM model and other construction documents in the field, hopefully many of the errors in the quality control process can be remediated. The cafeteria project is a prime candidate for this technology due to the lack of quality control throughout the project.

Technical Analysis III *Historic Preservation*

This analysis breaks down each of the historic preservation decisions on a cost and schedule basis. These findings will then lead to value engineering decisions. This section also contains a breadth for architectural design. This breadth determines a way to keep the historic character while maintaining modern appeal.

Technical Analysis IV *Advanced Lighting Controls*

The final analysis looks into combining the new design for the skylight system with an artificial lighting system in the dining room. By combining the use of photovoltaics and advanced lighting controls, the dining room has potential to use net zero energy for lighting. This section contains an electrical and renewable energy breadth as well



Problem

Buildings are becoming more and more complex in the name of sustainable design. Unfortunately not all members of the construction team are as familiar with these sustainable design concepts as the engineers that design them on a project. Owner's are not knowledgeable on these systems and thus are not willing to pay for them, or pay for them only for the LEED plaque. Contractors are not knowledgeable on installing many sustainable construction systems and thus the systems never perform how they are designed to. Finally, facilities crews are unfamiliar with how to maintain sustainable systems, and use quick fix solutions which prevent them from ever meeting the performances they were designed for.

For all of those reasons, the construction industry needs to be informed on High Performance Building systems. The Department of the Interior Modernization project is no different from the projects described above. As stated in the introduction, construction on the previous areas of the building was started in 2001. Recently the General Services Administration has decided to seek LEED Certification for those areas using Retro-Commissioning. Retro-Commissioning revealed that most of the sustainable systems were not performing as designed because of the way the facilities crew had been maintaining them. Similar situations arise in buildings across the country thus making knowledge High Performance Buildings a critical industry issue.

Goal

The goal of this analysis is to reveal all of the reasons for the short comings in the construction and maintenance of High Performance Buildings. Upon these findings, the best means for solving these issues will be discussed and reviewed. Generally most of this analysis will be qualitative and reflective.

Methodology

1. Determine the shortcomings of each of the members of the construction team in process of constructing and maintaining High Performance Buildings
2. Communicate with the Design team for information on the building's high performance systems
3. Communicate with the Commissioning Team about the Retro-Commissioning findings in the rest of the building
4. Communicate with the CM Agent for the training procedures given to the facilities crew

TECHNICAL ANALYSIS # 1: CRITICAL INDUSTRY ISSUE:
HIGH PERFORMANCE BUILDINGS

5. Gather feedback from the construction team from what each party feels need to be done.
6. Determine what can be done to increase communication amongst the construction team to ensure that High Performance Buildings are constructed and maintained so that they perform up to their design standards.

Resources

PACE Roundtable Discussion

Jacobs Commissioning

General Services Administration Building Facilities

Expected Outcome

It is expected that this analysis will reveal that communication and lack knowledge is the reason for downfalls in High Performance Building. This analysis should bring together the input of each member of the construction team as to how to rectify this problem.

Problem

Quality Control was a problem throughout the construction of the Department of Interior Cafeteria. Most issues stemmed from lack of communication amongst the project team. Material deliveries were not checked with specifications, finish systems were not installed per the contract documents, and punch list items were unclear and repeatedly failed inspection.

Materials were often delivered to the site, marked as being delivered, but often never inspected to make sure that they were the specified materials. A quality control person can physically look at the material, but unless they have the construction drawings or specifications along with them, mistakes can occur. The wrong ceramic wall tile was installed, the wrong colored caulk was placed, and the wrong type of acoustic tile was put in all because they were not inspected properly upon delivery.

Frequently during the project, entire architectural systems were installed improperly. The biggest issue lied in the transitions from one finish to another. In most instances, it was just a lack of communication with the subcontractor as far as what the detail or specification called for.

Finally, all the short comings in the quality control process came to light during the punch list process. The cafeteria punch list consisted of over 1600 items. Most of these items were given vague descriptions with even more vague locations. Due to lack of clarity, most items were deemed complete by the contractor but then deemed incomplete upon the construction manager's review. This lack of communication led to the punch list process lasting for over two months and taking dozens upon dozens of unnecessary man hours.

Goal

The goal of this analysis is to research how the implementation of Tablet PCs with the BIM model can remediate quality control issues. BIM is a great communication tool and it can benefit both the design and construction team. Using Tablet PCs will bring the BIM model out to the field, where it can maximize its potential.

Methodology

1. Interview the construction team for all short comings in the quality control process
2. Research some Tablet PC's background information
3. Communicate with industry professionals that have implemented Tablet PC's already
4. Research other areas where Tablet PC's could benefit the project as to further justify their use
5. Do cost and schedule analysis to quantitatively compare using vs. not using Tablet PCs with a BIM Model
6. Summarize findings

Resources

Jacobs Engineering (Construction Management Agency)
Barton Malow (Industry Professional using Tablet PC's)
AE 473
Applicable Literature

Expected Outcomes

It is expected that this analysis will prove that using Tablet PCs provides a significant advantage in the construction process and can provide both cost and schedule savings from prevention of construction errors.

Problem

The Department of the Interior Building was built in the 1940's under President Roosevelt's New Deal. The original building materials used, are almost as meaningful to the Department of the Interior office, as the murals upon its walls. For this reason, the architect was instructed to preserve some of the cafeteria's original design, to ensure that some of its history could live on. The architect decided to save all the wall murals, the dining room wall and column tiles, the stone wall bases, and the stone floor transitions. Many of these decisions were made purely for design reasons, and did not take constructability or value engineering into mind. Some of the preservations would take countless labor hours and cause a number of constructability issues.

Goal

The goal of this analysis is to review the architectural preservation decisions and provide as much information for cost and schedule analysis as needed to make value engineering decisions.

Methodology

1. Break out each historic preservation decision
2. Determine the cost for labor for each preservation
3. Determine the impact to schedule for each preservation
4. Determine the architectural impact of removing that feature
5. Make a value engineering decision for which historic preservations is worth keeping

Resources

Project Architect

R.S. Means

Expected Outcome

It is expected that most of the architectural historic preservations will not be justified based on labor cost and schedule impact. With that said, most historic preservations are not kept based on economic decisions. This analysis will give a better understanding of the marriage of those two factors.

Problem

One goal in designing the cafeteria was to take advantage of every potential situation for sustainable design. The cafeteria lighting system uses energy efficient ballast and luminaires. The cafeteria design also uses a new skylight system and roof. Thirdly, the new lighting system for the dining room does not have lighting controls that measure the amount of daylight available and then adjust the amount of artificial light necessary. These three design features have the potential to work together and produce a zero net energy lighting system for the cafeteria dining room.

Goal

The goal of this analysis is to incorporate photovoltaic panels either in the skylights themselves, or on the dining room roof with an advanced lighting system so that the dining room can be illuminated without any additional power.

Methodology

1. Determine the lighting requirements for the dining room
2. Determine the energy demands for cafeteria's lighting requirements
3. Do solar studies to measure the amount of natural sunlight in the space
4. Research lighting control systems
5. Research photovoltaic systems that can meet the lighting demand
6. Perform cost analysis for this system
7. Summarize the economic cost/savings of making this design change

Resources

AE 311

EE 212

Applicable Literature

Dr. Riley

Expected Results

I expect to find a system that will provide sufficient electricity to power the Dining Room lighting demands. The hard part will be finding a system that will make economic sense for the owner to pay the upfront cost. The General Services Administration plans on owning this building for most likely its entire life, and thus they will be more likely to accept a longer payback period than most private building owners.

DEMONSTRATION OF BREADTH

Architectural Breadth

An architectural breathe will be performed in Analysis III (Historic Preservations). The original cafeteria design focuses attention on the preserved historic materials such as the murals and ceramic tiles. Analysis III looks into each historic preservation and uses value engineering to determine what should stay and what should go. By deleting some of these historic materials, the dining room's architectural appeal is affected. This breadth will redesign the dining room's architecture to account for these changes.

Electrical/Renewable Energy Breadth

An electrical/renewable energy breadth will be performed in Analysis IV (Advanced Lighting Controls). Analysis IV takes into account the cafeteria's new skylight and dining room lighting systems. These systems currently do not work together and thus use excess energy to provide more lighting than needed during daytime hours. By using Advanced Lighting Controls the artificial lighting system can be used to only supplement the skylight system when necessary. In addition to advanced lighting controls, photovoltaics may be incorporated into the new skylights so that dining room lighting system could become self-sufficient and use net zero energy.

WEIGHT MATRIX

Description	Research	Value Eng.	Const. Rev.	Sched. Red.	Total
Analysis 1: High Performance Building	20%	-	-	-	20%
Analysis 2: Using Tablet PCs for Quality Control	-	-	10%	10%	20%
Analysis 3: Historic Preservation	-	10%	10%	10%	30%
Analysis 4: Advanced Lighting Controls	10%	10%	10%	-	30%
Total	30%	20%	30%	20%	100%

TIME TABLE

Tech. Analysis I
 Tech. Analysis I
 Tech. Analysis III
 Tech. Analysis IV

Spring 2011 Thesis Schedule														
Jan-10	Jan-17	Jan-24	Jan-31	Feb-7	Feb-14	Feb-21	Feb-28	Mar-7	Mar-14	Mar-21	Mar-28	Apr-4	Apr-11	
Research								Spring Break '11						
		Interview Design Team												
				Interview Commissioning										
						Interview Construction Team								
Research										Compile Report				
	Interview Industry Professionals													
				Interview Construction Team										
						Cost and Schedule Analysis								
Define Historic Preservation Options										Compile Report				
		Cost and Schedule Analysis												
			Architectural Analysis											
						Value Engineering								
Determine Requirements										Compile Report				
			Research											
						Cost Analysis								
									Compile Report					
												Final Summary Due April 7th		
												Faculty Jury Presentations April 11th-15th		

CONCLUSION

Conclusion

The Department of the Interior Cafeteria Modernization project was not perfect, nor is any construction project. The purpose of this proposal is to outline the areas that have room for improvement. Some of these applications are solely meant for this project while others are industry wide problems. All of these analyses are meant to better the cafeteria project. Ensuring the high performance design is carried out through construction and maintenance will produce a better a building. Using technology to increase efficiency and solve problems will help the construction process. Performing value engineering on the historic preservations will prevent the owner from buying architectural features that do not have an end result worth their cost. Finally, combining design concepts to promote sustainability will save the owner and the environment. These proposed ideas will result in a better project for all parties involved.