

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
CAFETERIA  
MODERNIZATION



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INTERIOR CAFETERIA  
MODERNIZATION

1849 C STREET NW,  
WASHINGTON D.C.

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THESIS PROPOSAL

REVISION #1

# INTRODUCTION

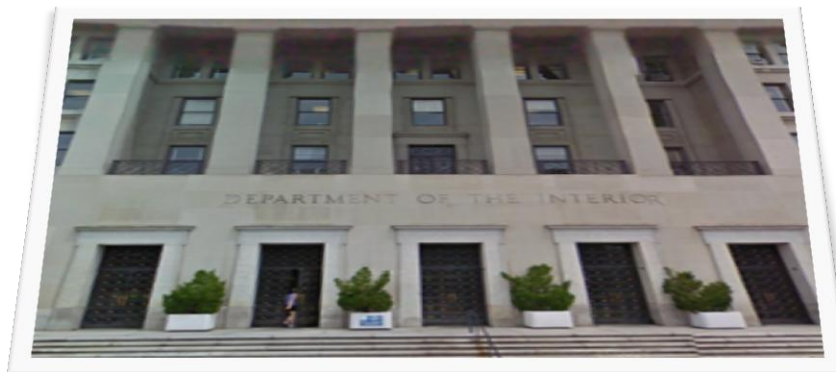
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The Department of the Interior building is located at 1849 C Street Northwest in Washington D.C.. It was constructed in 1936 under the New Deal, and featured some of the most state of the art features in the building industry, such as air conditioning 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, server 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

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This Thesis Proposal serves as 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: Using Tablet PCs for Quality Control*

Analysis I will research the use of Tablet PCs in the field to specifically aid in the quality control process. By being able to access the BIM Model and other construction documents in the field, 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 II** *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 will also contain an architectural breadth which will propose an alternative design without the historic preservations.

## **Technical Analysis III** *Advanced Lighting System*

The final analysis looks into combining the new design for the skylight system with the artificial lighting system in the dining room. By combining the use of advanced lighting controls with a new photovoltaic system, this analysis will attempt to create a Net-Zero Energy lighting system for the dining room. This section will include a lighting/electrical breadth for the design of the photovoltaic system.



## **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 can remediate quality control issues. New developments in software and the growing use of BIM have led to a new 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. Although Tablet PCs can benefit the entire construction process, the majority of this research will dwell on the ability to create better quality control to benefit cost, schedule, and overall quality.

## Methodology

1. Research some Tablet PC's background information
2. Communicate with industry professionals that have implemented Tablet PCs already
3. Determine all short comings in the quality control process on this project
4. Create an implementation plan for using Tablet PCs for this project
5. Select proponents of the project that could have been directly benefitted by using Tablet PCs
6. Do cost and schedule analysis to quantitatively compare using vs. not using Tablet PCs on those proponents
7. Reflect on findings

### *Resources*

Jacobs Engineering (Construction Management Agency)  
Todd Povell Davis Construction (Industry Professional using Tablet PC's)  
AE 473  
ENR Magazine

## 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
6. Proposal Alternative Architectural Finishes
7. Create Revit Model of Space
8. Compare Cost and Schedule impacts of original vs. alternative design

### *Resources*

Project Architect  
R.S. Means  
Revit

## Expected Outcome

It is expected that most of the architectural historic preservations will be more schedule intensive and costly than using new construction materials. 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. Unfortunately, the new lighting system for the dining room does not take advantage of advanced lighting controls to measure the amount of daylight available with a Daylight Harvesting System (HDS) and then use a Centralized Dimming and Switching system (CDS) to adjust the amount of artificial light necessary. These systems propose an opportunity for energy savings. Although these systems may decrease the amount of energy necessary, they will not result in a Net-Zero energy lighting system for the dining room.

## Goal

The goal of this analysis is to incorporate photovoltaic panels on the dining room roof to produce enough energy to make a Net-Zero energy lighting system for the dining room. By decreasing the amount of energy necessary with the installation of a HDS and CDS system and actually producing energy with photovoltaic the dining room should be able to be self-sufficient or at least need minimal auxiliary power.

## Methodology

1. Research existing lighting system
2. Select HDS and CDS systems
3. Determine the lighting electrical demand
4. Research PV design
5. Perform solar studies to measure the amount of solar power available
6. Calculate amount of available space of PV panels
7. Research photovoltaic systems that can meet the lighting demand and fit the amount of roof available
8. Perform cost analysis for this system
9. 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 fit in the a lot amount of space that is not hampered by shading and yet still reach the necessary demand load. 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

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### **Architectural Breadth**

An architectural breathe will be performed in Analysis II (Historic Preservations). The original cafeteria design focuses attention on the preserved historic materials such as the murals and ceramic tiles. Analysis II 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.

### **Lighting/Electrical Breadth**

A lighting/electrical breadth will be performed in Analysis III (Advanced Lighting Systems). Analysis III 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, photovoltaic will 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.	Construction Relevance	Schedule Reduction	Total
Analysis I: Using Tablet PCs in the Field for Quality Control	15%	–	5%	–	20%
Analysis II: Historic Preservation	10%	20%	5%	5%	40%
Analysis III: Advanced Lighting Controls	15%	–	25%	–	40%
<b>Total</b>	<b>40%</b>	<b>20%</b>	<b>35%</b>	<b>5%</b>	<b>100%</b>

## CONCLUSION

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### 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. 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.