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# Final Thesis Proposal

## Kaiser Permanente- Medical Office Building

**8008 West Park Drive**
**McLean, VA 22102**

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# Executive Summary

The Senior Thesis Final Proposal is intended to describe the initial ideas developed for the four analysis topics of the Kaiser Permanente Medical Office Building. The descriptions include the specific systems and methods that will be used to execute each analysis and identify the effects on value, cost, schedule and constructability.

### *Analysis 1: Integrated Project Delivery Method on Coffer Re-design Issue*

In order to address the cost and time challenges associated with the coffer re-design of the existing waffle slab, the project delivery method for this project needs to be reconsidered. The project delivery method will be changed from design bid build to Integrated Project Delivery to research the impact this would have on the coffer design issue. An IPD case study will be explored in order to compare the process, risk, and cost of IPD versus the design bid build process used. Conclusions will be drawn from this analysis to see the benefits gained from IPD and how they could have been implemented on this project.

### *Analysis 2: Façade Re-design*

Due to the water infiltration issues associated with the existing, cracked precast panels and glazing, a new façade design will be explored. The exterior façade will be replaces with a unitized Curtain Wall system to encompass both the cladding and glazing in one unit. Considerations such as the mechanical effects, cost, and value added will be looked at in detail to see if this is a viable option. A mechanical breadth study will also be incorporated into this analysis for further investigation.

### *Analysis 3: LED Temporary Lights*

With the extensive amount of medical equipment and high demand for energy, the maintenance costs and energy consumption of this building can result in staggering numbers. The lifecycle costs and carbon footprint of the building can potentially be a problem in the future if not addressed during design. To address this issue, a study will be conducted to compare the energy and cost of an LED temporary lighting system versus the standard fluorescent temporary lighting system used. For this analysis, the study is going to encompass the whole building utilizing LED lights. The amount of energy that can be saved during the construction timeframe just by converting from fluorescent to LED will be researched. Also, cost analysis for this product will be explored by finding the payback period as well as considering the initial upfront cost versus the money saved from energy savings. An electrical breadth will also be performed in order to thoroughly analyze this solution with data and calculations.

### *Analysis 4: Addition of Green Roof Exterior Terraces*

Due to the fact that Kaiser Permanente MOB is a renovation of an existing structure, the lack of sustainable features is something to be addressed. Sustainable design is a critical industry issue that is becoming a standard for most commercial buildings to utilize. Since this building will house patients, the potential solution involves incorporating green roofs on the existing exterior terraces and providing patient access to promote healing. The large terraces offer a great opportunity to utilize the open space for a unique sustainable feature. Since Kaiser

Permanente believes that light and nature aids in the healing process, a green roof terrace would support their vision. Factors such as initial and maintenance cost, value added, and contribution to patient healing will be analyzed to further explore this solution.

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# Project Background

The Kaiser Permanente Medical Office Building at Tysons Corner is located at 8008 West Park Drive in McLean, Virginia 22102. The occupant of this medical facility will be Kaiser Permanente, a predominant healthcare company in the area. The project involves the conversion of a 241,175 sq. ft. existing facility from a commercial type office building to a modern 5-story medical office building plus a lower level and basement. The new MOB will include surgical suites, ASC, CDU, Imaging departments, pediatrics, OB/GYN, Cardiology, radiology including MRI's, Hematology/Oncology clinics, Optical services and pharmacy retail. The renovation includes complete interior build out, new glass and glazing, installation of reinforcing steel, refurbishing of existing elevators and installation of a new 7-stop patient elevator. There will also be the addition of a new 75 foot mechanical tower to be built on the south side of the building to house the MEP systems and new mechanical units.

The construction management team on the job is Jacobs, the General Contractor is DPR Construction and the architect is Anshen+ Allen. The Engineers on the job are Cagley and Associates, Inc. (Structural Engineer), Leach Wallace Associates, Inc. (MEP Engineer), DPR Construction (BIM Engineer) and Vanasse Hangen Brustlin, Inc. (Civil Engineer and Landscape Architect). The start date of construction was March 16, 2011 and the substantial completion is May 8, 2012. This project is a Design–Bid-Build with a contracted GMP amount of $44, 078,649.

The architectural focus of the building is meant to be state of the art and modern to depict Kaiser Permanente's new spin on healthcare. The exterior façade consists of existing precast panels and the installation of metal panels. A storefront glass curtinwall system will be at the main entry points, as well as metal canopies, balconies and towers. The building will utilize natural light with large ribbon windows wrapping the building. A noteworthy characteristic of the existing structure that will remain are three large outdoor terraces jutting out on the exterior of three stories of the building. The architecture of the site will also undergo advancements such as the improved vehicular roundabout at the entrance to support circulation to the facility.

# Analysis 1: Integrated Project Delivery Method for Coffer Redesign Issue

### *Problem Identification*

The Kaiser Permanente MOB project uses the traditional design bid build approach as its project delivery method. Though this is a typical method, some projects could experience great benefits of utilizing an Integrated Project Delivery Method. IPD is a new critical industry issue that is struggling to be implemented because of its unfamiliarity and vague benefits. Although it is important to realize that IPD is a great method to consider for increased accuracy of estimating and to gain a greater understanding of design by the project team.

The Kaiser MOB experienced issues regarding approval for the coffer design of the existing waffle slab configuration. The design discrepancy caused ongoing cost and schedule problems throughout construction. This hindrance was mainly due to the repetitive and lengthy process for review, redesign, and resubmission of the altered design. At the time the final design was approved and shop drawings were received, work had already begun for interior build-out. This change in design resulted in reconfiguring phasing of above ceiling rough-in, the inability to hang the track for the framing studs and a chain reaction of other trades that were to continue or begin work in these areas. This design issue contributed to a 2 month schedule delay of interior build-out and major cost concerns. The costs estimated during the bid process did not anticipate these design delays during construction, which proved to be another negative attribute of Design Bid Build.

### *Background Research*

- *DPR IPD Lecture*
- *PACE Roundtable 2011*

### *Research Goal and Potential Solution*

The goal of this analysis is to research and compare the costs and risks of IPD versus Design Bid Build specifically for the coffer design issue.

The potential solution for the cost losses and schedule delays associated with the coffer design issue is to implement Integrated Project Delivery Techniques early on in the project. This project delivery method would allow for collaboration during the design phase and a better understanding of the coffer design by all parties involved. This greater understanding of design results in better accuracy of cost estimates associated with this scope of work and less risk later on.

In order to thoroughly compare the results of IPD on the coffer design issue and produce tangible evidence, a similar design issue for an IPD project will be researched. During this exploration, the process of design, risk associated with the design later in construction, the costs for estimating the design and scope of work, etc. will be looked at. These practices will be compared to the Design Bid Build practices for the coffer design on the Kaiser Project. Conclusions will be drawn from this analysis to see the benefits gained from IPD and how they could have been implemented on this project.

### *Methodology*

- Review the details of the design discrepancy that arose with the coffers
- Contact General Contractor and personnel to find the process involved in estimating the coffer design during bidding. Also find costs allocated for risk, unforeseen conditions, and scope of work.
- Interview coffer design Bid team on their knowledge of the design. Ask if conversing with project team earlier on could have produced better understanding of the design.
- Converse with engineers of the project to find their perspective on coffer design cost and risk.
- Contact subcontractor who performed the coffer design work and their role in design
- Find/ Research Case studies of projects that used Integrated Project Delivery Methods.
- Contact members of case study project teams to receive cost data and opinions on IPD Method.
- Compare cost data and risks of coffer design under Design Bid Build approach versus the IPD case study.
- Summarize results found and formulate the cost benefits and risk IPD can have on design versus the traditional Design Bid Build delivery method

### *Resources and tools to be used*

- General Contractor
- Engineers
- Owner
- Subcontractors
- Project team members of Case study
- Information from Pace Roundtable
- Relevant publications
- Industry Members

### *Expected Outcome*

The results of the analysis are expected to support the idea that Integrated Project Delivery is a viable option for projects to pursue. The findings of utilizing IPD should show cost benefits, less risk during construction and an overall efficient estimating and design process. The outcome can prove that if IPD were utilized, the coffer design issue could have been mitigated as compared to the Design Bid Build approach.

# Analysis 2: Façade Re-design

### *Problem Identification*

The existing precast panels on the exterior of the building and the windows were both experiencing water leakage due to cracks in the panels and gaps in the windows. There was not any work originally associated with the panels or windows besides power-washing them since they are to remain as the permanent building enclosure. Although after testing the panels for water infiltration, they failed the testing and cracks were found in many of the panels. After potential solutions were given, the owner decided to not replace the panels but instead spot treat the cracks with an epoxy injection. For the windows an added scope of work was added to the original GMP which includes an entirely new glazing system including aluminum mullions and glazing units. From a value perspective of the building, there are better solutions that could have been utilized instead of a quick fix to the existing panels. Also, as seen in Image 1, the building is outdated and not utilizing its full aesthetic potential from the renovation.


Image 1: Exterior Facade

### *Background Research*

- Spoke with General Contractor's Project Manager about potential options for improvement.
- Explored potential Curtain wall options and benefits.

### *Research Goal and Potential Solution*

The goal is to replace the existing precast panels and glazing with a complete Curtain wall system that would add aesthetic value, remediate waterproofing issues and improve daylighting and sustainability of the building.

The potential solution of replacing the existing precast panels and glazing with a complete Curtain wall system is mainly to add value to the building. Updating the existing building façade would significantly enhance the aesthetic characteristics of the building. The existing precast panels are an outdated look that does not align with Kaiser Permanente's forward thinking outlook on healthcare. An updated Curtain Wall could allow for Kaiser to collaborate and add further input on the building's design and appearance.

If a Curtain wall system were to be used, it would consist of all one unit that would be hung on the structure's frame. This one unit system would include enclosure and glazing, which would eliminate the need for replacing the existing glazing separately. By utilizing a Curtain wall, both water infiltration problems associated with the panels and glazing could be solved. The type and size of the glazing used for the Curtain wall could greatly impact the mechanical design of the building and utilize value engineering practices. This also allows for further analysis in a mechanical breadth study to see the benefits of adding a Curtain wall system such

as daylighting. These breadth study areas will be detailed further in Appendix A-Breadth Study Topics.

### *Methodology*

- Research types of Curtain Wall systems while considering type, size, feasibility, cost, etc.
- Interview the owner for further input on their aesthetic vision for the building
- Speak with Mechanical Engineers for mechanical design consultation
- Perform Mechanical Breadth calculations to determine the daylighting requirements for the building with different glazing types
- Design the Curtain wall system
- Determine the constructability factors associated with delivery and erection of the Curtain walls system
- Compile results of aesthetics, water infiltration and mechanical impact associated with the Curtain wall system chosen

### *Resources and Tools*

- Owner
- Curtain Wall manufacturer
- Mechanical Engineers
- Mechanical AE Faculty
- General Contractor
- Knowledge from applicable AE courses
- Relevant publications
- Industry Members

### *Expected Outcome*

After this analysis and breadth topic, it is expected that the Curtain wall system chosen will provide value in numerous ways to the building. These areas will include enhancement of exterior aesthetic appeal, improved protection against water infiltration, and mechanical benefits including increased daylighting.

# Analysis 3: Replacement of temporary lights from Fluorescent to LED

### *Problem Identification*

A potential problem of the Kaiser MOB project is the lack of sustainable features that were incorporated into the design. With the extensive amount of medical equipment and high demand for energy, the maintenance costs and energy consumption of this building can result in staggering numbers. The lifecycle costs and carbon footprint of the building can potentially be a problem in the future if not addressed during design. As discussed during PACE as a critical industry issue, sustainability is becoming a popular topic and opportunities are increasing. Though sustainable features tend to demand a high upfront cost, the future benefits over the course of the building are rewarding when considering lifecycle costs. Also, in order to ensure this building has a long lifecycle, it needs to stay current with the industry standards. This means that in order to ensure a timeless building design, the Kaiser Tysons Project needs to explore further sustainable practices.

### *Background Research*

- Conversed with a representative for the LED temporary light product in California to further understand the system. The representative was more than willing to offer research, product data and case studies for this product. Consistent contact will occur throughout the development of this analysis for further insight.

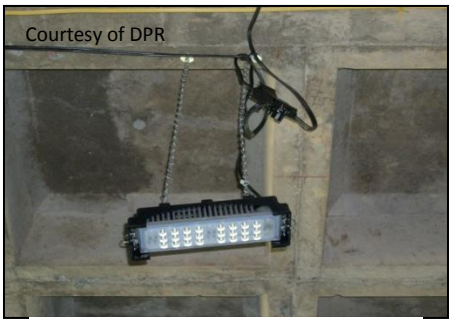

Image2: LED Temporary Light

### *Research Goal and Potential Solution*

The goal of this research is to address the lack of sustainable features and the high energy demand of the building systems. This will be addressed by switching all temporary lights from fluorescent to energy saving LED lights.

In order to reach this goal, the potential LED energy savings system that this project began to utilize on a small scale will be applied to the entire building. The majority of the temporary lighting used in the building was the typical fluorescent lighting. The only exception was on the first floor which had a single circuit of 15 temporary LED lights. These LED temporary lights are a new product that use a lot less energy and could potentially lead to cost savings versus typical fluorescent lights. The small study was started on this system by simply tracking the energy consumption of the fluorescent versus LED system. For this analysis and breadth topic option (detailed further in Appendix A), the study is going to encompass the whole building utilizing LED lights. The amount of energy that can be saved during the construction timeframe just by converting from fluorescent to LED will be researched. Also, cost analysis for this product will be explored by finding the payback period as well as considering the initial upfront cost versus the money saved from energy savings. These costs can be compared to the standard fluorescent temporary light system to understand the magnitude of savings and benefits incurred.

### *Methodology*

- Compile research already collected about LED product
- Speak with LED light representative about analysis and his suggestions.
- Research the quantity of fluorescent lights and LED lights that the entire building needs in order to meet temporary lighting requirements
- Find the initial cost, payback period, energy cost and energy consumption associated with fluorescent temporary lights for the entire building
- Find the initial cost, payback period, energy cost and energy consumption associated with LED temporary lights for the entire building based on the data of the small case study results.
- Compare all cost and energy data of fluorescent versus LED lights
- Summarize conclusions of results and decide if LED lights are viable solution

### *Resources and tools to be used*

- Daniel Lax, Clear-Vu Lighting
- AE Faculty
- Kaiser Permanente Project team
- Relevant publications
- Industry members

### *Expected Outcome*

This analysis is expected to show the potential energy savings and long term cost benefits of LED temporary lights instead of fluorescent lights for the Kaiser project. This analysis could further prove that LED temporary lights are a great opportunity for Kaiser Permanente to start using this product on all their projects and decrease their energy costs. Ideally, it could become a part of a new industry trend to explore better ways to sustain the building during the construction process through temporary lighting.

# Analysis 4: Utilize Green Roof on Exterior Terraces

### *Problem Identification*

A potential problem for the Kaiser Permanente building is the lack of sustainable features that the building incorporates. Since it is an older building, the original design did not include sustainable features because they were not existent at that time. However, now that building sustainable features is becoming popular and is considered a critical industry issue, the lack of sustainability this project has is not sufficient. A client such as Kaiser that is becoming increasingly successful in the healthcare world needs a building that shows this. Due to the fact that this is a healthcare building, green features and increased lighting are aspects that could add value for the patients and owner.

### *Background research*

- Exploration of the effect of nature and light on the healing process

### *Research Goal and Potential Solution*

The goal of this analysis is to add value and sustainable features to the design of the building.

The potential solution involves incorporating green roofs on the existing exterior terraces and providing patient access to promote healing. The large terraces, as seen in Image 3, offer a great opportunity to utilize the open space for a unique sustainable feature. Since Kaiser Permanente believes that light and nature aids in the healing process, a green roof terrace would support their vision.

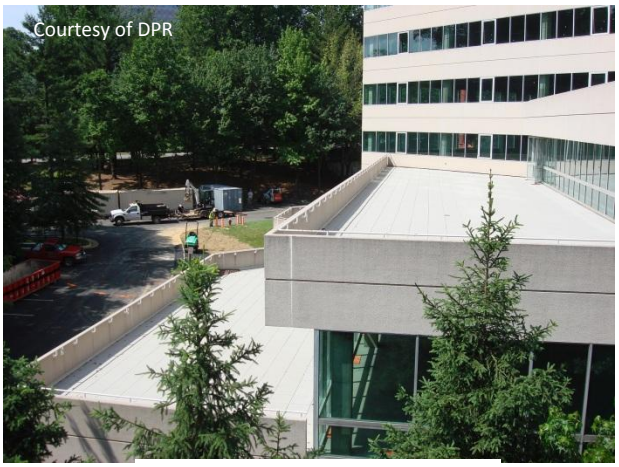


Image 3: Exterior Terraces

The different types of green roofs could be researched and compared to see which would apply best for a medical facility. Also, the cost for installation and upkeep could be compared to the cost of the renovation of the existing terraces. The cost of a green roof can potentially outweigh the amount of value added for the owner and its patients. Another benefit of the green roof terraces is that structural support for added load does not need to be considered such as a typical green roof would require. The terraces are stable and will not affect the structural stability of the building, which decreases cost and risk. Maintenance costs will be determined based on the type of green roof chosen and its requirements for upkeep.

### *Methodology*

- Research benefits of light and nature on healing process
- Explore advantages of green roofs to building value
- Research types of green roofs
- Find Costs associated with installation and maintenance by speaking with manufacturers/ subcontractors
- Compare value added versus cost of installation and maintenance

### *Resources and tools*

- Green roof manufacturers/ subcontractors
- Industry members
- Relevant publications

### *Expected Outcome*

Once the green roof feature is installed to the exterior terraces and analyzed, it is anticipated that this will produce positive results. The benefits of this addition are likely to improve the sustainability of the building, offer value at a reasonable cost, and improve the well-being of the occupants.

## Analysis Weight Matrix

The weight matrix, as seen in Table 1, is a percentage representation of the main areas of investigation that each analysis will cover.

| Description | Research | Value Eng. | Const. Rev. | Schedule Red. | Total |
|---|---|---|---|---|---|
| Analysis 1: Implement IPD | 20% | | | 10% | 30% |
| Analysis 2: Façade Redesign | | 10% | 10% | | 20% |
| Analysis 3: LED Temp. lights | 10% | 20% | | | 30% |
| Analysis 4: Green Roof on Terraces | 10% | 10% | | | 20% |
| **Total** | **40%** | **40%** | **10%** | **10%** | **100%** |

Table 1: Weight Matrix

## Timetable

The preliminary semester timetable found in Appendix B indicates the milestones and progression flow in order to successfully meet the analysis goals. This schedule will ensure that all necessary steps to perform each analysis will occur in a timely manner.

# Conclusion

The proposal is designed to develop analyses for the Kaiser Permanente MOB in core areas of: critical industry issues, constructability review, schedule acceleration and value engineering. The analyses identified were utilizing Integrated Project Delivery Method, façade redesign, using LED temporary lights, and installing Green roofs on exterior terraces. The Research, methodology, resources and tools used, and expected outcome were all investigated in this proposal

# Appendix A:

# Breadth Study Topics

# Breadth Topics

***Electrical Breadth*** *(Incorporated into Analysis 3: LED Temporary Lighting)*

For this breadth topic I will utilize subject matter learned in AE courses such as AE 311. The purpose of the breadth will be to further explore the electrical/ lighting benefits of the LED temporary lights. Data that will be calculated for both fluorescent and LED to aid in comparison include the initial cost, the payback period, the energy consumption, the foot-candles needed in the building during construction and the foot-candles emitted. All of this data will be analyzed to incorporate into a summary and final recommendation as a viable solution.

***Mechanical Breadth*** *(Incorporated into Analysis 2: Façade Redesign)*

For the mechanical breadth topic the areas of further analysis will deal with the mechanical effects of the unitized Curtain wall system. The benefits of the Curtain wall system to be investigated will include daylighting, reduced air infiltration, solar gain, water infiltration and thermal comfort. These benefits can potentially lead to less mechanical equipment needed within the building which can result in cost savings for the owner. Also, the idea of a unitized Curtain wall will be researched to find how equalized pressure aids in reducing water infiltration, which has been a reoccurring issue for the building.

# Appendix B:

# Spring Semester Preliminary Timetable

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