

# MONONGALIA GENERAL HOSPITAL

MORGANTOWN, WV

## THESIS PROPOSAL

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CONSTRUCTION MANAGEMENT

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## **Executive Summary**

This thesis proposal defines the areas of investigation to be completed through later research and analysis of building components and construction processes.

### Analysis 1: Exterior Façade

This analysis is focused on alternative exterior façade systems to reduce the drawn out schedule due to current exterior construction. The optimum choice will aim improve the project in all aspects including schedule, cost, quality, and constructability. This change in façade system will involve three breadth areas: building structural analysis, exterior enclosures energy analysis, and building envelope acoustical analysis.

### Analysis 2: 3D Coordination Using BIM

This analysis is focused on a hot topic currently in the industry. The use of building information modeling is becoming more extensive and the many benefits are apparent. In his analysis, a look into how BIM is implemented on similar projects will lead to a suggested process for use on the Monongalia General Hospital Addition and Renovations Project and the primary benefits will be evaluated.

### Analysis 3: Owner Assistance

This industry research topic looks into the role of the owner on a project. The experience and knowledge of the owner play a large role in every phase and process of the project. This research includes case study analysis of previous projects, industry personnel interviews and industry surveys.

### Analysis 4: Phase Planning & Infectious Risk Control

This analysis focuses on the environment on the construction site. There are many considerations in the design and construction or renovation of a health care facility. Research on the proper risk assessment and planning of construction phases may yield changes to the current processes to improve infection prevention and project phase scheduling.

## **A. Analysis 1: Exterior Façade**

### Problem Statement

The exterior façade on the new Monongalia General Hospital Tower Building consists of a hand laid brick veneer system with metal stud backing in order to match the existing building. The project schedule calls for almost a year's time for the exterior façade construction. This critical path activity is crucial to the remaining activities and the final completion of the project.

### Solution

Alternative façade systems such as precast panels will be the main focus of reducing the exterior façade construction time.

### Research and Analysis Steps

The initial steps to finding an alternative façade system are exploring current systems that are capable of matching the existing building's red brick façade. This first and foremost criterion is important in order to maintain the aesthetics of the building. I will begin with initial research of alternative façade systems to replace the existing hand laid brick system. By consulting with contractors, manufactures, and other industry personnel, a list of proposed systems will be gathered for comparisons on cost, constructability, schedule reduction, quality, and building compatibility. Since this analysis will be covering three core thesis areas of investigation (value engineering, constructability, and schedule reduction), it is essential that each of these areas be reviewed for peak performance. After reviews of the proposed systems, a single most appropriate system according to the guidelines mentioned above, will be chosen. The new system will then be analyzed on a more detail level to find the exact schedule duration and cost. Further research into less quantifiable areas such as quality and constructability will also be conducted. A final comparison between the new and existing system will be performed to yield the result of the better choice for the building.

### Expected Outcome

Given the new technology and advances in precast construction, I expect an alternative exterior façade system will be found that will reduce the lengthy façade construction duration. As a result I also expect to see cost reductions in the overall project due to the shortened schedule. The exterior façade may also see cost savings from the system itself as well as a slight boost in quality and constructability.

## **B. Analysis 2: MEP Coordination Using BIM**

### Problem Statement

Hospitals such as the Monongalia General have extensive mechanical, electrical, and plumbing (MEP) systems in order to handle the complexity and high performance of a health care facility. Lighting and electrical systems range from typical fluorescent lighting and wall receptacles to operating room lights and intensive care equipment receptacles. In addition, multiple data, telecommunication, and emergency systems are present throughout the building. In order to provide the best patient care, optimum HVAC systems supply clean comfortable air through bulky ductwork, taking up a large amount of the available space for MEP systems. Next, almost every room in the hospital requires domestic hot and cold water supply and waste removal and ventilation. Lastly, medical gas lines are routed throughout the hospital to the majority of the rooms. With so many systems throughout the building, it is easy to see how problems can occur. Clashes between system routing are inevitable. These issues often require multiple coordination meetings and redesigning which take months to sort out, eventually to find more conflicts that aren't caught until in the field, resulting in timely and costly changes.

### Solution

New technological advances in the industry allow for 3-dimensional designing and modeling of building components such as MEP systems. Using Building Information Modeling (BIM) to design and coordinate the MEP systems for the Monongalia General Hospital Addition and Renovations Project, could reduce the project schedule and decrease costs due to system conflicts.

### Research and Analysis Steps

Many construction managers are now using this new process on their projects. The research on this topic will begin by looking into projects using this process and others who have not. Projects of similar size, cost, location, and use will be compared to demonstrate the benefits of using 3D MEP coordination over traditional methods. I will also speak to multiple industry personnel to obtain further insights to the success of this process. After background research is complete, I will then generate the hypothetical use of BIM on the Monongalia General Hospital Addition and Renovations using data from research of 3D MEP coordination on comparable projects, to then yield the possible benefits that could have come from using it on the project.

### Expected Outcome

With a little prior background research on the subject, I can confidently expect positive results from further research on the use of 3D MEP coordination on similar projects. I expect to find benefits in the form of reduced schedule during the designing and coordinating of the systems as well as during the course of construction of the systems. I also expect to find cost reductions due to a reduction in project schedule in addition to a reduction in costly MEP conflict related change orders.

## **C. Analysis 4: Owner Assistance**

### Problem Statement

Many of the owners in this industry do not have the knowledge or experience to make many important decisions on a project. In this specific project the owner posed a great deal of challenges during the course of design and construction, most of which because of inexperience. In order for the owner to get exactly what they want in a project, they have to be more instrumental in the project processes, but in order to do so need to fully understand them. The high amount of problems in design, construction, and the overall project due to the owners themselves, is an issue that needs to be addressed.

### Solution

To alleviate the impact of an inexperienced owner on the project, the addition of an owner consulting or acting agency can be contracted by the owner to reduce the barriers between the owner and project teams.

### Research and Analysis Steps

The bulk of the information for this topic is going to come from research. The research will be in three different ways: case studies, industry personnel interviews, industry surveys. The review of literature on past projects with varying owner scenarios will initiate the specific areas which I can then focus my questions for industry personnel and surveys. The industry personnel interviews will be conducted with professionals from various stages of a project such as architects, designers, engineers, construction managers, and contractors. Through the interviews I hope to obtain thoughts, views, and experiences from each of the side of the industry that deal with the owner in different ways. Additionally, surveys will be broadly distributed in order to get more of a consensus from the industry on the issue. Together, all of the research methods should yield enough results to make a conclusion. Although difficult, I will also try to quantify the benefits of the Monongalia General Hospital using a support agency on the Addition and Renovations Project.

### Expected Outcome

After the investigative research I conduct, I expect to see a connection between owner inexperience and owner-project team challenges in the construction industry. I also expect projects in which the owner has some sort of a knowledgeable support team, such as a CM agency, to have less owner related changes and costs. This will confirm my beliefs that inexperienced owners are better off spending extra on owner support for the overall good of the project.

## **D. Analysis 3: Phase Planning & Infectious Risk Control**

### Problem Statement

Renovation projects pose a multitude of problems to the areas still occupied in building. Construction is a very dirty process in which airborne particles can infiltrate the occupied areas causing inhalation of harmful construction debris. The harmful airborne particles from construction debris are even more detrimental on a health care building with fragile patient's lives at risk. Similarly, each day an area of the building is out of commission it impacts the community's health and safety, not to mention the overall project costs and schedule.

### Solution

New construction and renovations on health care buildings require early involvement and planning to ensure proper steps are taken to prevent contaminated air from the jobsite from entering the health care facility. An essential first step is an infection control risk assessment (IRCA). This assessment provides the foundation for long range planning, as well as for each phase of the project, from concept to completion. Additionally, advanced planning of the construction processes and phases can reduce the risk of contamination.

### Research and Analysis Steps

The first step to this analysis is a large amount of research in the area of construction and renovations on health care facilities, specifically focused around the IRCA. This background information will be crucial to the decisions down the road. Literature available via the internet, case study publications, magazine articles, construction professionals, and health care professionals, will all be the means of acquiring the information needed to continue with analyzing the phases of the project. The phase plans presently used on the project will then be analyzed for compliancy with the precedence set from the information formerly gathered. A proposed phase scheduling plan, enhanced by the IRCA and other resources, will be prepared to improve the infection prevention methods as well as the overall project schedule. Research on general construction and renovation phase planning will supplement the IRCA investigation, to also ensure a timely construction delivery.

### Expected Outcome

Since I have little specific knowledge in the area of IRCA with construction and renovations on a health care building, I can say I will at the very least greatly increase my knowledge on the issue. Not that the project encountered any problems in this area, I suspect I may find ways to improve and ensure better protection from construction contamination. I do also hope to save time by more closely planning the construction into smaller, more easily managed areas and phases.

**E. Conclusions**

The four analysis topics proposed cover multiple areas of investigation in the construction option as well as extent into the other architectural engineering options. A large amount of research on the systems and methods to improve the stated problem areas will be needed to ensure the appropriate option is decided upon. The research provides a head start into the further investigations of value engineering, constructability review, and schedule reduction, which are key factors to successfully managing a construction project.

Weight Matrix

<b>Description</b>	<b>Research</b>	<b>Value Eng.</b>	<b>Constr. Rev.</b>	<b>Sched. Red.</b>	<b>Total</b>
Analysis 1: Exterior Facade		10	10	10	30
Analysis 2: MEP Coordination Using BIM	10			10	20
Analysis 3: Owner Assistance	20				20
Analysis 4: Phase Coordination & Infectious Risk Control	10		10	10	30
<b>Total</b>	40	10	20	30	<b>100%</b>



## **Appendix A: Breadth Studies**

### Exterior Façade Structural Support

The new exterior façade system may require different support than the existing brick veneer system. Depending on how the new system ties into the structure, the addition or reduction of weight could result in a reassessment and redesign of the structural system. The costs, schedule impact, and constructability of the resulting structural design will be included to fully analyze the ramification of changing the exterior façade system.

### Exterior Façade Acoustics

The new exterior façade system may change the acoustics of the building in a negative or positive way. The resulting acoustical qualities will be analyzed and compared to the existing enclosure system as well as the industry standards for health care facilities. In the event the acoustics improve, it is seen as an addition to the value engineering of the building. In the event the acoustics worsen, additional research and analysis on the methods to then restore the acoustics, to at least the level of the existing enclosure system, will be conducted. The costs associated with the additional acoustics will be included to further compare the systems.

### Exterior Façade Energy Analysis

The new exterior façade system can have an impact on the thermal qualities of the building. An energy analysis on the building enclosure on both the new and existing systems will indicate the need for changes in the mechanical system. The cost of such changes will be compared and included in the comparison of the exterior façade types.