

BUCKHORN MEDICAL OFFICE BUILDING



Senior Thesis

Executive Summary

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Executive Summary

The Buckhorn Medical Office Building was built by Alexander Building Construction and was recently completed in November 2009. The total cost of construction was approximately \$11.7 million over a timeline just under two (2) years.

The existing curtainwall system for the building is an aluminum metal panel system that wraps around the entire building. The construction team ran into problems early on in the project with getting submittals approved and then getting materials on-site. The first analysis of my senior thesis project is to re-design the exterior system using a pre-cast concrete panel system. I will investigate the architectural aspects as well as the structural implications of using pre-cast panels versus aluminum. I will also investigate the schedule and sequencing implications through the use of a 4D model.

The second analysis I have chosen for my thesis involves replacing the existing HVAC system with a geothermal heat pump system. This idea was originally proposed as a value engineering idea, but was turned down due to high initial costs. I will re-evaluate this mechanical system through the use of the current mechanical Revit model. I have also chosen to research solar PV panels and how the Buckhorn Office Building can benefit from their sustainability. I plan to research initial costs, lifecycle costs, and rate of return of the panels. I will use the Revit model to perform solar studies to maximize the solar gains.

The third analysis involves estimating and how BIM can be effectively used to increase productivity and efficiency. I will use various methods of performing quantity takeoffs and estimates to compare accuracy of numbers as well as efficiency of time use. I will also use the BIM model to analyze lifecycle costs of the proposed value engineering ideas.

My last analysis will focus on constructability, scheduling, and sequencing of the project using the BIM model. I will incorporate 4D models from the re-designed structural sequencing and re-designed pre-cast panel erection to build a 4D model for the entire project that will enable the superintendent to more effectively manage the construction site as well as create look-ahead schedules for subcontractors.

APPENDIX A

Breadth Studies

Architectural Breadth

The re-design of the exterior curtainwall will be a significant change in the aesthetic appeal of the building and careful consideration for design will be taken to try and emulate the aluminum panels as closely as possible. I believe that the pre-cast advantages outweigh the few aesthetic qualities the aluminum panels may have. Because the Buckhorn Office Building is a fairly basic shape, panel fabrication and design should not be a concern. Accuracy of color and texture will be paramount in achieving an aesthetic appeal approved by the architect.

Structural Breadth

With the re-design of the exterior curtainwall, there will be a significant increase in load applied to the outside edge of the building. Structural calculations and assessments will be made to ensure the steel frame will be capable of handling the added loads. With this structural re-design, the foundation support system will also be re-evaluated to ensure the spread footings and soil bearing capacities are capable of handling the added loads.

Mechanical Breadth

One of the original value engineering ideas was to use a geothermal heat pump system over a typical VAV system. It will be necessary to assess the current HVAC system and make changes to equipment and piping to ensure the geothermal system will work properly. It will also be important to evaluate the geotechnical report in order to locate the geothermal wells on the site and make sure they are up to the requirements of the system.

Electrical Breadth

With regards to adding sustainable design features to the Buckhorn Office Building, solar PV panels will be researched and evaluated for initial cost as well as lifecycle costs. Solar studies will be completed to ensure proper placement and adjustment for maximum solar exposure. The loads provided by the panels will also be calculated to determine the return on investment.