



SENIOR THESIS FINAL REPORT

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1.0 EXECUTIVE SUMMARY

Senior Thesis Final Report is intended to discuss the findings and conclusions of the three analyses performed on the Episcopal High School Centennial Gymnasium Addition/Renovation. This project includes a 60,000 SF new gymnasium addition as well as 39,000 SF of renovation work to the existing gymnasium and wrestling facilities. Each topic is centered on the central theme of improving efficiency in the construction industry: project procurement efficiency, prefabrication efficiency and energy efficiency.

ANALYSIS #1: Critical Industry Issue

The current economy has forced many companies to venture into unfamiliar markets with different procurement strategies. A shift from negotiated GMP contracts to hard bid lump sum contracts requires a change in techniques and methods when pursuing projects. This analysis entailed a qualitative perspective on this critical issue by interviewing several industry members and comparing techniques. The analysis showed that the main factor for success when pursuing hard bid lump sum projects is establishing relationships with subcontractors and securing the bottom-line pricing to produce the most competitive bid.

ANALYSIS #2: Elimination of Inefficiency through use of Prefabrication

Site congestion and minimal storage/lay down space has lead to trades working inefficiently and unsafely on site. The masonry trade has occupied the most space on site and encountered many delays due to inefficient work. This analysis showed that utilizing prefabricated panels for the façade in lieu of the designed CMU wall with brick veneer reduced the amount of on-site labor and trade coordination and eliminated delays due to inefficiency. This was achieved due to the ability to start the precast erection after the concrete superstructure, instead of overlapping the major trades as originally scheduled. Also, the precast panels produced a significant savings of nearly \$460,000 when considering the removal of CMU/brick, the reduction of spandrel beam size and the cost/SF of precast panels.

ANALYSIS #3: Feasibility and Design Study for Photovoltaic Energy System

The Centennial Gymnasium project is slated to achieve LEED Certification upon completion. However, the project has utilized very few sustainable techniques that could provide a financial benefit to Episcopal High School. The focus of this analysis was a design and feasibility study for a rooftop PV system. This analysis showed that the 9000SF South facing roof area of the New Centennial addition could be utilized to construct a PV array capable of producing enough energy to support all of the overhead gymnasium lighting in both the new and existing gymnasiums. A preliminary structural analysis revealed that there would be no impact to the design and the electrical analysis provides recommendations for connecting to the existing system. Taking into consideration the rebate/incentive programs within the state of Virginia, the feasibility study showed that the system would recuperate initial costs within 14 years of start-up.