

1.0 Executive Summary

This AE Capstone Senior Thesis Report is written to talk about the UMBC project and also discuss the three analyzed topics that were performed on the building. The UMBC Performing Arts & Humanities Facility is a \$67 million, 90,000SF facility with four floors and a basement. In this building are a variety of performing arts amenities including theaters, studios, classrooms and offices. The topics performed are intended to improve the efficiency such as cost and schedule reduction on a construction job. The following are the analyses researched: the prefabrication of precast panels, the comparison between mobile cranes and a tower crane, and the study of PV roof panels.

Analysis #1 – Prefabrication of Precast System (Structural Breadth)

Since the university has certain goals for this project to be completed on time and efficiently for the students, the use of prefabrication may be very useful. Also, being that the building is made up of three different structural elements, this poses a challenge of erecting the building because adjacent work has to stop in order for a certain area to be completed. By performing this analysis of using prefabricated precast panels instead of the original masonry brick veneer system, it was found that the schedule was reduced by about 90 days and the amount of delays caused by trade coordination decreased. This was caused since the steel superstructure had to be fully complete before the precast would be erected. Also erecting on average 12 pieces of precast per day was a more efficient technique of reducing the time to build the façade. The only downfall is that, using these precast panels will add an extra \$50,000 to the masonry cost.

Analysis #2 – Tower Crane vs. Mobile Crane (CM Depth)

Being that the site utilizes a tower crane positioned on the southwest corner of the building that has a very large swing radius for a smaller building footprint, it is proposed that it was not necessary to have such a large crane. There is enough space on site that the possibility of using a few mobile cranes instead may help save time and cost. This analysis showed that eliminating the tower crane would have a positive impact on the schedule. Unfortunately because the crane belonged to the concrete contractor, it saved them money initially compared to having to find other cranes to replace the production with.

Analysis #3 – Study on Photovoltaic Roof Panels (Electrical & Structural Breadth)

The UMBC Performing Arts & Humanities Facility had tried to look into utilizing PV panels on the roof being that this building is supposed to be the first building on campus to become LEED Certified. Due to financial implications, this sustainable technique was deleted from the plans early on. The purpose of this investigation is to design a PV roof system and show how much energy could be produced, and save the owner money after a certain payback period, despite the removal of this idea in the preconstruction phase. After performing this analysis, it shows that it is possible to add a specific PV roof system to the Humanities section of the building and that the PV's on that roof will be able to produce the total load of all the lights on those four floors of the Humanities section. After taking everything into consideration such as the structural impact and the electrical tie-in, the study of this photovoltaic roof panel system concluded that the owner would start receiving money back from the system after 6 years of paying for the initial cost.