

1.0 Executive Summary

Senior Thesis Final Report is to discuss and provide a comprehensive background and four solutions or enhancements to construction issues about the Sterling and Francine Clark Art Institute through analyzing of schedules, different types of estimates, investigations, and evaluations. The project is adding a new extension to accommodate the new needs. The new addition serves as an exhibition, conference and visitor center, and a new plant where the new addition's equipment such as Heating/Ventilation/Air-Conditioning (HVAC) and electrical units will be placed and to accommodate some of the existing museum mechanical needs.

Analysis 1: Implementation of MEP Prefabrication

The Mechanical/Electrical/Plumbing (MEP) systems that are embedded in the 2 ½' thick mat slab is the main construction issue. Many conflicts were spotted before construction which called the need to build a 3D model to better coordinate the embedded system. The analysis was performed on the plumbing system utilizing the 3D model and achieved the following findings: 3.5 days saved from the project's critical path, and a net savings of \$57,771.

Analysis 2: Building Information Modeling – Virtual Mockup

The successful use of building information modeling (BIM) in 3D Coordination on the project is a proof of how BIM is beneficial to construction projects. The project team at the Sterling and Francine Clark Art Institute has efficiently utilized only 3D coordination BIM use. The goal of this analysis is to explore and suggest more applicable BIM uses as they are project specific. The virtual mockup analysis presents different benefits and limitations of the application from different standpoints. The analysis resulted in increasing the efficiency of the project as well as aiding future modifications to the building. It will cost \$240 to build the model built for this analysis after labor hours' savings.

Analysis 3: Precast Roof Planks

With the irregularity in the shape of the Sterling and Francine Clark Art Institute, pouring concrete in corners can be tedious and challenging. The precast units can ease the construction process by having the ultimate unit size with exception of corner units to reduce joints and onsite resizing. The goal of using the precast units is to increase productivity and constructability of the building. With the great advantages the analysis will represent, such as 18 days of savings of the project critical path and \$47,601 of net savings, it is not recommended to go with this analysis due to the building nature and location. The analysis will study the structural impact (structural breadth) by the new system.

Analysis 4: Solar Photovoltaic (PV) Panels

Being a green building is not implicitly means obtaining LEED certifications or having lower carbon footprint. It can also mean more energy cost savings with reasonable payback and less dependency on electric generators. The PV panels are to assist in electricity generation to power the high energy consumption of the art institute. The analysis will study the electrical production (electrical breadth) by the new system. The system cost is \$227,646 after incentives and rebates and the payback period calculated to be six years. However, in the course of 25 years, the owner will end up saving \$544,520.