

Executive Summary

The AE Senior Thesis Proposal is the commutation of multiple technical analyses developed through Fall 2013 to Spring 2014 with the knowledge gained in the Architectural Engineering curriculum as well as through industry members' experience. This report focuses on the construction of the Twin Rivers Elementary/Intermediate School in McKeesport, PA. Four analyses were executed in an effort to provide possible improvement to project schedule, cost and long term operation and maintenance plan. The construction of public educational facilities and the implementation of innovation construction theory and criterias are also analyzed in this report.

Analysis 1: LEED Implementation

This project is aiming for a LEED Gold Certificate by completion. There are a lot of LEED features incorporated in the design. However, in current design some LEED features are only incorporated for showcase purpose. The possibility of using the renewable energy produced on-site was studied. With the proposal system, LEED Platinum Certificate can be achieved. Life cycle cost analysis was conducted to compare the cost and benefits of both systems. There will be about \$1,500 cost saving from energy each year. More savings can be anticipated if the project joins Pennsylvania Wind for School Project.

Analysis 2: Value Engineering

The owner, the project team and the designer have worked together on this project to implement value engineering. In this analysis, the possibility of cost reduction from sizing up the electrical distribution system was studied as the electrical breadth. The impact from the proposing use of roof-top wind turbine units to the structural system was proved to be minimal as in the structural breadth. The payback period for the proposed renewable energy system is only 10% of the equipments' expected life time based on calculation.

Analysis 3: Schedule Acceleration

The construction of Twin River's School is scheduled to be completed within 21 months. Due to this project is the construction of a public school, the substantial completion date was extremely important to the owner. Three possible scenarios were studied for schedule acceleration purpose, including implementation of SIPS method and LEAN construction. The results showed that there will the significant cost and schedule saving with the implementation of a precautionary and reaction plan for unexpected impacts. The Last Planner Method is also a good way to address the existing schedule issue.

Analysis 4: BIM Implementation

There were several key activities and change of design that caused increased costs and schedule delays. These problems could have been overcome with the utilization of BIM to facilitate cooperation between different trades. BIM could be used as an alternative construction method through phase planning, information management; as well as for operation and maintenance planning after turn over. The implementation of BIM would also help to realize owner's goal to make this project a role model of high performance educational facility. A BIM execution plan was laid out and significant improvements for project schedule and cost are seen.