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Construction Management Option

Final Proposal

Bellefonte Area High School

Bellefonte, PA

Table of Contents

Executive Summary

This report will present the main areas of my thesis project. The research will include depth and breadth of the construction industry as it relates to the Bellefonte Area High School. These topics of research will stress in some way a critical issue facing the industry today, a value engineering analysis to increase the value of the building, a constructability review and schedule reduction. The topics that I will be using for these devices are a new structural wall design in the classroom areas to increase day lighting, some new aspects to the electrical system to make them more energy efficient, and the use of the roof as a green roof for insulation to cut down on heating and cooling costs of the building. This report will give steps by which data is to be obtained and how it will be used to relate these topics to the building industry.

I will also be covering a critical industry issue and how I will apply it to my research. I will be looking at barriers in communication and common myths that inhibit the green building industry. This issue will be researched through talking directly to both sides of the industry, the builders and the buyers. Included will be example questions that could come up in an interview; these questions will help paint a picture of the public's view toward the green building industry and if there are any negative repercussions from their beliefs.

Technical Analysis #1

Structural CMU for Classrooms: Currently in the wall design for the structural system of the classrooms, there are plans drawn up for solid grouted CMU to be used. This will be matched in other areas not needing structural CMU with decorative CMUs. . A steel system will be analyzed, allowing for more square footage to go to windows and decorative CMU used to match wall design in other areas. Cost data would need to be looked at in depth to determine if there were any cost differences for the steel system as compared to the current system. Also, acquiring the steel to fit with the current schedule will have to be compared to what schedule reduction is accomplished with using a different system. Some research would also be done in the benefits for students in classrooms with abundant day lighting. Assuming that the steel system would be comparable to the current system, benefits in classroom performance may be possible with a new wall design, as well as achieving a design scheme that would ease coordination problems.

Steps to be taken for CMU change:

- First, a cost must be established for the current system. This data will be compared to the cost of the new system. This information will be gathered through a RS Means or MC2 estimate.
- Next, the equivalent system of steel must be calculated to bear all necessary loads and cost data then determined from the new system make-up.
- Area given to additional day lighting will then be calculated and given with any additional costs that are incurred from the new system.

- Data on the benefits of additional day lighting in classrooms as it relates to student performance will also be given to justify any additional costs.

Technical Analysis #2

Electrical System change: With the enormous amount of energy that schools consume daily, energy saving devices put in place could greatly reduce the cost of electricity. According to the EPA Green Lights Program, green lights lighting upgrades save 48% of a buildings lighting energy on average. Other buildings with green lighting systems have also made on average 36 cents internal returns on Simple motion activated switches similar to those used by The Pennsylvania State University could decrease energy consumption. Similar systems that have automatic shut-off capabilities during certain times of the day could also be utilized to save energy. An analysis would have to be done on the change in cost versus specific savings that would be incurred. Research done in unused high school rooms that maintain lights on during the day will have to be compiled. Some of the largest systems that could save on lighting alone would be the gym areas that use large lights with incredible voltage outputs. This new electrical system could be used as a value engineering design that would increase the overall value of the building.

Steps to be taken:

- Research will be done on how many and how often school classroom lights are on during the day with no one in the room, to include gyms and corridors.

- Devices will be chosen and data will be given on cost savings for turning off lights while not being used. Penn State will be an excellent source for cost savings through this method.
- Next, implementation will need to be determined as to how energy saving devices will hook into the electrical system.
- Information on additional hookups, panel boards and wiring will be found for the installation of these energy saving devices.
- The cost of these devices and their installation will be directly compared to data about energy reduction with approximate savings calculated using local energy rates.

Technical Analysis #3

Unused Roof: The current roof system is only utilized for holding the HVAC equipment and the roof covering itself. The presence of a green roof could greatly decrease the amount of energy used to heat the building in the winter and cool the building during the hotter months. A cost analysis would need to be done comparing the results of savings from other schools with green roofs to the extra cost incurred by adding and maintaining the green roof, as well as possible additional structural support needed to carry the load from the green roof. Also, relocation of HVAC units may need to be considered if it would interfere with green roof construction. All this data will be used to determine if adding energy saving devices are an efficient use of value engineering to increase the value of the school while still aiding the environment.

Steps to be taken:

- Additional loads from the green roof will be the most important factor in determining what is needed for a green roof.
- This information will be used to calculate any additional reinforcement needed to support the green roof. Cost will be determined in MC2.
- Data will be obtained from other green roof construction projects as to energy saved from the additional insulation from the green roof.
- The cost of additional reinforcement will be directly compared to the energy savings to determine any additional value added to the building.
- The mechanical system will be looked at to determine if any changes are necessary due to the green roof.
- LEED factors will also be discussed for the presence of a green roof that will give additional benefits.

Industry Critical Topic:

Myths and rumors, as well as barriers in communication and a general lack of knowledge about the green building industry readily available to the public inhibit the ease with which owners, contractors, and subcontractors are willing to switch or adopt green construction products and methods. Some of the possible myths include increased cost for constructability of green systems, difficulty of installing and using green products and systems, and that attaining a LEED rating is not worth the effort and produces a building not much different form a non-LEED rated building. Much of these

myths inhibit communication about green building systems because people have a preformed bias about these systems.

Steps to be taken to determine untruth myths:

- Interviews will be set up over phones and in person with people in the construction industry.
- A list of questions will be asked to determine their views of the green building industry, as well as their experience with myths or pre-formed bias.
- Next, interviews will be conducted with both the general public and specific owners looking to build in the future.
- They will be asked questions as to the extent of their knowledge, as well as any myths or problems they have with the green building industry.

From the questions and answers derived from the interviews, an overall picture will be determined as to the extent with which the green building industry is viewed negatively. These interviews will be concluded with information as to the many benefits of the green building industry and then owners will be asked if they would consider using green building practices in the future.

Conclusion

While the technical analysis of the Bellefonte High School looks at value engineering, constructability, schedule reduction and even critical issues of the industry, an overall goal will also be accomplished. Through this additional value and technical data, an overall step toward discovering the benefits of the green building industry will be

discovered. My thesis will attempt to cover all aspects of improving a building through the core thesis investigation areas while also attempting to connect them to the green building industry. I believe that more projects can become green buildings without losing value or function.

Weight Matrix

Description	Research	Value Eng.	Const. Rev.	Schedule Red.	Total
Struct. CMU	5%	5%	10%	5%	25%
Electrical		15%		10%	25%
Green Roof	5%	5%	15%	5%	30%
Green Myth	20%				20%
Total	30%	25%	25%	20%	100%

Possible Questions :

(during interviews about green building construction)

- Do you know what the green building industry is?
- Have you ever been inside a green building?
- Do you think it is more expensive to use green building products?
- If any extra cost is needed, do you think it is worth using green building products? Why?
- Have you ever read anything on or about the green building industry?
- Have you ever used green building products in any of your work?
- Have you talked to owners or provided owners with information about the green building industry?
- Have you noticed an increase in cost or difficulty in using green building products?
- Do you feel the general public or owners are uninformed or incorrectly informed about the green building industry?
- Do you think they need to be more informed? If so, how would you inform them?