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Construction Management Option  
Technical Assignment 3  
Alternative Methods and Research



Bellefonte Area High School  
Bellefonte, PA

# Table of Contents

A. Executive Summary	3
B. Critical Industry Issues	4
C. Critical Issues Research	5
D. Problem Identification	8
E. Technical Analysis Methods	9
F. Weight Matrix	11

## **Executive Summary**

This paper details four main areas of focus in regards to preparing the final thesis proposal for the Bellefonte Area High School. This report includes revised critical industry issues as derived from the 2006 PACE Roundtable Discussion. It also includes critical issues research methods describing the goal of future research as well as technical analysis methods that describe the problems also stated in this report.

The PACE Roundtable discussions took place at the Penn Stater in several conference rooms. People from all over the area as well as from neighboring states, came to discuss current industry issues facing the construction process today. All aspects were discussed during this all day conference extravaganza. Several different meeting times held different subject, from procurement and commissioning to structural systems and green building construction. Since most of my thesis will be centered on green building construction aspects, the green building industry PACE discussion will be the focus of my attention.

Also, the report will be detailing a critical issue currently facing the industry. I will be looking at the green building industry and current hurdles that inhibit its progression. I will also identify several possible problems with the Bellefonte Area High School and describe possible solutions and research methods for obtaining results. There will be a weight matrix that will give the breakdown of time for the focus of my thesis project.

## **Critical Industry Issues**

PACE Roundtable discussion sessions greatly helps to connect students to members of the construction industry. Although many times most students were to afraid to say anything unless directly asked a question, the conversation that did take place between members of the industry and the faculty advisors provided a window into the construction industry that students would not normally get a chance to see. I was surprised to see that almost all of the people from the construction industry were willing to talk and give their input, even if their experience was only limited to a few occurrences. I was also surprised to see that students could come up with questions that the industry did not necessarily have answers for. Most times, lots of information was given about the particular question, but it was decided that a final answer could not be reached.

I particularly liked the Green Construction discussion, especially since my final proposal will include a green building construction aspect. There are many new advances in green construction industry, it seems that the largest problem with the green construction industry is the consumer's skepticism towards actually going through with green building construction. This lack of confidence is an aspect that I would like to pursue as a research topic. With both Dr. Riley and Dr. Horman being large supporters of the green construction industry, they will be beneficial to talk to about specific green building processes. Also, my industry contact from Reynolds Construction is very interested in the green building industry and seems to be fairly knowledgeable.

This lack of confidence from the consumer towards the green building industry was also talked about extensively. One of the most difficult aspects was the lack of

information for very long term benefits, as well as communication factors. There is no information currently available about performance of products and methods after 30 years of use. Most times, estimates of projected savings are all that is available for certain green building construction uses. Technical aspects of using green building products are also lost on owners much of the time. The owners tend to not have the knowledge base to understand intricate workings of products and systems, so communication is often difficult. This lack of detailed knowledge also tends to have owners/consumers more likely to listen to and believe rumor, media, and myth. This allows the owner to focus more on simple data that they can see for themselves; namely cost data and energy efficiency of products. Providing cost savings and efficiency datum for products and systems from the green building industry are key to influencing owners to switch to green products whenever possible.

Trends and procurement toward the green building industry were discussed in depth. Certain trends tend to show to often times contractors can use green building products as readily as non-green products without suffering loss in performance or increase in price. This often times leads to green building products being used whether specified or not.

## **Critical Issues Research Method**

The critical issue that I would like to pursue through my research is lack of confidence towards green building products and systems, from not only owners and consumers, but from general contractors and subcontractors alike. I would like to

investigate possible lack of communication or barriers between those knowledgeable on the subject of green building construction with those less knowledgeable.

***Problem Statement:*** 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 but are not limited to 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 from a non-LEED rated building.

***Solution:*** The problem of myths and communication barriers toward the green building industry can be fixed by having all parties involved more knowledge on the subject. This is not always an easy task, especially in those ingrained in current methods, products, or suppliers. Events like the PACE roundtable discussion help to erase incorrect myths and establish better communication methods. Increasing the awareness of the general public, especially owners/consumers who have only urban myths and word of mouth information to base opinions on green building construction and LEED rated buildings. More publicity for green building construction in the media, as well as distribution of information to clientele of Architects and Engineers will help to erase more myths, untruths, and incorrect assumptions about the green building industry.

***Research Goal:*** The goal of this research is to understand the depths of myths and untruths about the green building industry. This goal includes both sides of the

industry, from the public to contractors. The most common myths and barriers to communication that need to be exposed to the public so that all people involved with the construction of a new building are better informed about the advantages of the green building industry to make them more likely to build or buy a green building.

**Research Steps:** The best way to gather data on public knowledge would be to poll all those involved with a new construction project. Phone Interviews and personal visits to key players could very quickly discover opinions toward the green building industry. These could be accomplished with a few simple questions and limited time frames. Some examples for the general public and owners on building project could include but are not limited to:

- Do you know what the green building industry is?
- Have you ever been inside a green building?

(If the person does not understand the green building industry, a short explanation would be given)

- 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?

Some questions for the construction side of the industry, which could include general contractors, subcontractors, architects, and even AE faculty could be but are not limited to:

- 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?

These questions would help to paint a picture of the extent of which both sides of the industry feel about green building construction. It would also establish opinions and devices with which information could be distributed and untrue myths dissolved.

## **Problem Identification**

Several problems with the Bellefonte Area High School will be identified and discussed in detail. These problems will be identified with the ability to discover a solution in mind and with the plausibility of using these problems for future thesis research.

- Site congestion. There are many phases of demolition, construction, and renovation that are occurring on the site at the same time. This presents many logistical problems, especially in the use of critical equipment and deliveries. Cranes on site will have multiple trades and activities to worry about while performing work.



- Safety and site protection. The demolition taking place on site is, in some cases, not complete demolition, but demolition to allow for renovations to be performed. With a tight schedule, improper demolition hurting existing structures could inhibit project completion on schedule.
- Structural CMU walls in classrooms cut down on the amount of day lighting and window space that be built. Changing the structural system to allow for more day lighting would be beneficial.
- There is asbestos on site, so proper precautions must be taken to handle the removal of the asbestos and asbestos containing materials. Additional equipment and safety gear will be needed to ensure the safety of workers.
- The large electrical system being installed to support the new HVAC system and the new lighting system uses large amounts of energy. Cost saving products and energy efficient systems could be used to decrease energy consumption.
- The current roof system is not being utilized for anything other than holding the HVAC units. A utilization of this space could help energy efficiency and even aide in achieving a LEED rating if a green roof is installed.

## Technical Analysis

**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. Since decorative CMUs are already being used on site, to increase day lighting in the

classrooms, a change in the current structural system be could implemented. A steel system could be utilized instead, 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 ensure that a different system did not delay construction. 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.

**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. 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.

**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. Since there are no plans currently used for the roof, data will also have to be compiled on whether time will need to be added to the schedule. Also, relocation of HVAC units may need to be considered if it would interfere with green roof construction.

## 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%
<b>Total</b>	30%	25%	25%	20%	100%