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The Partnership for Achieving Construction Excellence (PACE) roundtable event was held at Penn State in the fall of 2007. This event inspired the basis for the construction industry research issue. The roundtable motivated me to look more closely at the English-Spanish language barrier in the construction industry, and what problems are created from this barrier. Globalization is prevalent in most markets today, and each industry must create strategies to adapt and compete in the ever changing economy. This inspired the first thesis analysis which addresses the status of the barrier today, surveys industry members, identifies the top consequences from the barrier, and discusses possible solutions.

The Washington Christian Academy owner is concerned with cost constraints on the project, but ensuring that the job is done well and that the building is of high quality is more important. The owner put some contingency money in the project budget to allow for changes and additions, but would most like to use the money for last minute upgrades that would really make the educational facility first class.

Since high quality is a priority to the owner, I began looking into ways to increase the quality of schools. This project is not pursuing any substantial sustainability aspects, even though it has been proven that students perform better in cleaner, sustainable environments. According to the Pennsylvania Governor's Green Government Council, the three main environmental factors that affect students' performance are: better acoustics, utilization of natural light, and improved indoor air quality⁴. Schools that implement these features are healthier, more cost efficient, more sustainable, and the students are more productive.

Research has proven that as a result of bettering the three aspects mentioned above, student test scores increase, attendance rates are higher, and the students and staff are healthier. Additionally, the energy consumption of the building generally decreases which saves the owner money every month from the electrical savings. It was based on these findings that the two of the technical analyses were inspired.

The second thesis analysis is entitled Redesign of Gymnasium Ductwork: Replace Sheet Metal with Fabric Duct. This analysis contains an AE mechanical and acoustical breadth. The analysis addresses the first environmental issue: better acoustics. The mechanical ductwork in the gymnasium is redesigned with fabric duct and the acoustical implications are calculated. Additionally, the advantages of the new system are discussed and construction implications as far as cost and schedule are covered.

The third thesis analysis is entitled Incorporation of Daylighting in Classrooms. This analysis contains an AE lighting and electrical breadth. The analysis addresses the second environmental issue: utilization of natural light. Natural light will only be beneficial to students and reduce energy consumption when the lights are turned off. This analysis focuses on incorporating the concept of daylighting into the

⁴ Information obtained from *Green Schools* found at <http://www.gggc.state.pa.us/gggc/cwp/view.asp?a=516&q=157111&gggcNav=|6833|>



classrooms. By using daylighting technology, the students will be able to benefit from have increased natural light and the owner will see energy cost savings.

The final environmental factor, improvement of indoor air quality, is not addressed in a technical analysis. There are many viable options for the owner to consider, such as adding advanced filtration systems to the mechanical system or installing CO₂ sensors in the classrooms. Advanced filtration, for example using Ultraviolet Germicidal Irradiation (UVGI), would clean the air much more efficiently and thoroughly than then current filtration system. CO₂ sensors in the classrooms monitor levels of the gas in the air which often causes fatigue and unhealthy conditions for students. Once a certain CO₂ level is reached, the mechanical system triggers the allowance for more outdoor air rather than re-circulated. Either of these solutions would generate a higher quality of indoor air. However, these additions would have to be addressed from a value engineering standpoint because while they would add quality, they would also increase cost. These methods would be adding value to the school, bettering education for the students, and possibly decreasing lifetime cycle costs of the mechanical systems. Due to a lack of time and resources, I cannot fully investigate this issue but I wanted to briefly mention its importance in a school environment.

In summary, I have chosen to investigate three areas of study. The first pertains to the entire construction industry and the latter two pertain specifically to the WCA. The owner would appreciate these improvements because they are focused on producing a high quality environment at a reasonable cost. I expect that all of my technical analyses will result in a better learning environment and cost savings, which creates a happier, healthier environment for the occupants and the owner.