AEI Team #04-2013

February 22, 2013

Mechanical Design

ASCE | STUDENT COMPETITION

Team 04-2013

Our one true aim is to enhance the quality of the communities we work with through innovative ideas and an integrated design approach.

Ingenuity | Quality | Enjoyment | Integrity

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Executive Summary

The mechanical team has addressed the design and construction issues that were essential to the development of a new elementary school to be located in Reading, PA. After reviewing the project requirements, **two separate construction phases** were proposed, with the first being for the elementary school and the second for the clinic and natatorium space. **Three separate mechanical systems** will be used, one for the school, clinic and natatorium.

Upon our analysis it was determined that a **ground source heat pump system** would provide the necessary thermal comfort to condition the spaces and allow the building to consume less energy. Design calculations supported the use of a split system for the ventilation and terminal units. By separating these systems, five dedicated outdoor air units will take the majority of the sensible and latent loads allowing for smaller terminal units ranging in size from ¾ to 3 tons.

The second construction phase was proposed as an add/alternate for the clinic and natatorium space. The proposal provides the owner the choice to proceed with construction for this element. The mechanical system for the clinic space was considered separately. Adhering to the team's assumptions for conditions of the existing school, the mechanical team designed a retrofit for the mechanical system to keep the clinical project low cost while reaping as many other benefits as possible. The proposed **variable refrigerant volume (VRV) system** with heat recovery was designed for low maintenance and a long life. It offered redundancy, energy efficiency, and sustainability, all critical characteristics for the space. The mechanical system for the natatorium included **an all-encompassing air handler unit** allowing for a space unique operating schedule and adequate control of the humidity and temperature in the pool area.